

KANE COUNTY
STANDARD SPECIFICATIONS AND DRAWING
DETAILS FOR DESIGN AND CONSTRUCTION

Adopted in _____, 2012



Revised By:

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**KANE COUNTY
DESIGN & CONSTRUCTION STANDARDS
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SECTION 1

DESIGN GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Purpose for these Construction Standards.
- B. Required design standards.
- C. Requirements for drawings.
- D. One year Guarantee of work.
- E. General requirements for licenses, permits, temporary utilities and traffic regulation.
- F. Requirements for testing and inspection.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO) current edition.
- B. State of Utah Department of Environmental Quality, Division of Drinking Water (UDEQ, DDW) Laws, Rules, and Guidelines, R309.

- C. State of Utah Department of Environmental Quality, Division of Water Quality (UDEQ, DWQ) Laws, Rules, and Guidelines, R317.

1.3 PURPOSE OF CONSTRUCTION STANDARDS

- A. These Construction Standards set forth minimum standards for improvements constructed within existing or proposed public streets, right-of-ways and easements within Kane County. Nothing in these Construction Standards shall be construed to prohibit improvements constructed to higher standards.
- B. These Construction Standards are for guidance and consistency, but are not to restrict professional judgment. Where unusual or exceptional conditions exist, variations and exceptions from these Construction Standards may be made by Kane County after receipt of written request and due consideration.
- C. All instructions in these Construction Standards are addressed to Contractor/Developer, unless otherwise noted. These Construction Standards consist of written text and drawings.
- D. The improvements shall include all improvements of public need, including, but not limited to streets, water, sewer, power and drainage. Required improvements shall extend from the nearest acceptable point of existing improvements. Layout must provide for future extension to adjacent properties and shall be compatible with appropriate County general or master plans. All water lines shall be installed to the boundary lines of the subdivision.

1.4 DEFINITIONS

- A. Contractor: The person or persons actually performing the construction work.
- B. Customer: Any individual requiring utility services (power, water, sewer, etc.).
- C. Developer: Individual, association, firm, partnership, corporation, or entity proposing to make improvements within existing or proposed public streets, right-of-ways and easements within Kane County.
- D. County Engineer or Surveyor: The Kane County Engineer or Surveyor or his authorized representative.
- E. Owner: Sub-dividers, developers, or others responsible for constructing improvements or developments on property within Kane County. In the case of work bid out by the County as contract work, "owner" shall refer to the contractor doing the work.
- F. Sewer Service Lateral: Any sanitary sewer pipe a minimum of four inches diameter in size which runs from the outside of any building to the sewer main line.
- G. Sewer Collector: Any sanitary sewer line which is eight inches in diameter, or larger.
- H. Sewer Sub-Collector: Any sanitary sewer line which is six inches in diameter and less than 200 feet in length and having no more than one sewer service laterals (individual units) connected.
- I. Sewer Interceptor: Any sanitary sewer line which is greater than eight inches in diameter and having two or more sewer collectors as its tributaries.

- J. Sewer Outfall Line: Any sanitary sewer line which carries major sectors of the community or region having interceptor lines as its tributaries.

1.5 SUBMITTALS

- A. Construction drawings and specifications for culinary water projects shall be submitted to the Utah Division of Drinking Water (DDW) and Water of Special Service District (if applicable) for review and approval in accordance with DDW Rules for public water systems or the Southwest Utah Public Health Department (SUPHD) for non-public water systems.
- B. Construction drawings, specifications, and design criteria for wastewater collection and wastewater treatment systems shall be submitted to the Utah Division of Water Quality (DWQ) for review and approval in accordance with DWQ Rules.
- C. Percolation test results shall be submitted to the SUPHD for review and approval.
- D. Unless otherwise noted, submit two (2) copies of required drawings and specifications to Kane County (See Standard Drawings).
- E. Test results shall be submitted to county officials no later than three (3) days after date of test.

1.6 WARRANTY

- A. Owner/Developer shall provide a payment and performance bond, irrevocable letter of credit, or escrow deposit as security to guarantee improvements in good

condition for period of one year after date of final acceptance. Guarantee shall include all improvements such as utilities, roadways, curb and gutter, sidewalks and accessories. Security shall be held for warranty period.

- B. If during one year guarantee period Kane County determines that completed improvements need repairs or reconstruction, then Kane County will give written notification to Developer. Developer shall have 30 calendar days from receipt of written notification to complete repairs or reconstruction. If Developer fails to make repairs or reconstruction within 30 calendar days, then Kane County will arrange for repairs or reconstruction to be completed and cost will be billed to Developer. Following repair, bond or other security will be held for additional time beyond the original one year period at the discretion of Kane County.
- C. Within one year after completion, developer shall chip seal all paved road way surfaces. Chip seal shall conform to current UDOT Standards using a Type "A" chip with appropriate tack coat and flush coat. Following chip seal, bond or other security in the amount of the work, verified by Contractor's invoice, shall be held for one year after chip seal is completed.

PART 2 PRODUCTS

2.1 SIGNS, SIGNALS AND DEVICES

- A. Traffic Control Signs, Informational Signs, Cones, Drums, Flares and Lights: In accordance with Manual on Uniform Traffic Control Devices (MUTCD).

PART 3 EXECUTION

3.1 DESIGN STANDARDS

- A. Streets: Design in accordance to applicable current American Association of State Highway and Transportation Officials (AASHTO) Policy on Geometric Design of Highways and Streets and Guidelines for Geometric Design of Very Low-Volume Local Roads. Project Engineer shall complete Attachment A, Road Design Criteria Sheet to determine required road geometry. The following minimum general criteria also applies (see Standard Drawings):

1. Pavement Section:

- i. A Public Road shall be a minimum section of 2.5 inches of asphalt concrete pavement with 6 inches of untreated base course, unless pavement design requires greater section. Submit pavement design based on road traffic loading prepared by engineer licensed in State of Utah, or
- ii. A Public Road shall be a minimum of 3 layers of chip seal with 6 inches of untreated base course. The first layer of chip seal shall be $\frac{3}{4}$ " minimum chip size, with the final two layers being a minimum of $\frac{1}{2}$ " minimum chip size, unless pavement design requires greater section. Submit pavement design based on road traffic loading prepared by engineer licensed in State of Utah.
- iii. A Private Road shall be a minimum of 2 layers of chip seal with 6 inches of untreated base course. The first layer of chip seal shall be $\frac{3}{4}$ " minimum chip size, with the final layer being a minimum of $\frac{1}{2}$ " minimum chip size, unless pavement design requires greater section. Submit pavement design based on road traffic loading prepared by engineer licensed in State of Utah, or
- iv. A Private Road shall be a minimum 6 inches of untreated base course, unless pavement design requires greater section. Submit pavement design based on road traffic loading prepared

by engineer licensed in State of Utah.

2. Right-of-way widths:
 - i) 50 feet wide right-of-way may be used for cul-de-sacs and for new right-of-ways in a subdivision which do not serve or have the ability to serve land outside the subdivision or phase, and have a ADT of 400 or less. The right-of-way shall be internal to the subdivision.
 - ii) 66 feet wide right-of-way shall be used where other right-of-way widths are not allowed and/or required.
 - iii) 80 feet wide right-of-way shall be used for all roads within 200 feet of all Highways which access said Highways and all major collector and arterial roads for which a traffic study determines that a right-of-way width in excess of 66 feet is needed.
2. Longitudinal Grade: Not to exceed (a) major collector 8% (b) other streets 12% of grade. Lesser grades can be determined after considering average daily traffic (ADT) loading, design, speed, road surfacing, potential icing conditions. Complete Attachment A, Roadway Design Criteria.
3. Cross Grade, Shoulders, Superelevation, Etc.: Determine by completing Attachment A, Roadway Design Criteria.
4. Road Section Width: 28-feet minimum in accordance with cross-section detail drawing. Increase width where design element values and AASHTO standards require such.
5. Curb Corner Radius: Radius must be designed using AASHTO based on expected traffic type. The following apply to normal residential-type traffic:
 - a) Collector and Major Streets: Minimum of 25 feet.
 - b) Other Streets: Minimum of 15 feet.
6. Street Monuments: Place at center line angle points, intersections and

center of cul-de-sacs.

7. Signs: Street name and traffic signs required.

B. Culinary Water: Design and construct in accordance with Utah Department of Environmental Quality, Division of Drinking Water Rules (DDW), according to public water system (PWS) category that applies. All culinary water mains and appurtenances within the County shall be designed to provide for adequate future service for all contiguous areas which may, within a reasonable period in the future, be tributary thereto.

1. Minimum System Pressure (conform to current DDW rule):
 - a) Unless otherwise specifically approved by the executive secretary, no water supplier shall allow any connection to the water system where water pressure at the point of connection will fall below 20 psi during the normal operation of the water system.
 - b) Unless otherwise specifically approved by the executive secretary, public water systems constructed after March 1, 2006, shall be designed and shall meet the following minimum water pressures at points of connection:
 - 20 psi during conditions of fire flow and fire demand experienced during peak day demand;
 - 30 psi during peak instantaneous demand; and
 - 40 psi during peak day demand.
 - c) Individual home booster pumps are not allowed as indicated in R309-540-5(4)(c).
2. Main Lines: 8 inch diameter minimum size. 4 feet minimum cover to top of pipe (consider project local frost depth conditions). If final grades have not been established, use best information available to arrive at final cover depth.

3. Service Lines: 3/4 or 1 inch diameter minimum size. 3.5 feet minimum cover to top of pipe (consider project local frost depth conditions).
4. Fire Hydrants: Distribution system must be capable of delivering a minimum of 1,000 gpm to each fire hydrant without dropping below minimum required system pressure(s). In accordance with DDW Rule R309-550-5(5) average fire hydrant spacing must be no greater than 500 feet consistent with Appendix C of the 2003 International Fire Code. An exception may be granted if a suitable statement is received from the local fire protection authority. "Water mains not designed to carry fire flows shall not have fire hydrants connected to them." Minimum size lateral pipe serving any fire hydrant shall be six inches in diameter, and shall have an auxiliary valve at the hydrant.
5. Valves: Install appropriate valving to adequately control system and allow for future operation and maintenance. Install at all connections but not more than 1000 feet apart. Valve spacing shall be evaluated on a project specific basis. Locate at street intersections in line with property line extension. Use gate valves for valves less than 12 inches diameter and butterfly valves for valves 12 inches diameter and greater. Longer valve spacing on transmission lines shall be allowed on an individual basis. All distribution mains connecting to larger supply main lines shall be valved at the connection.
6. All public water mains shall be installed in an easement at least 15 feet in unobstructed width or in public rights of way with adequate access for maintenance vehicles.
7. Dead-end mains shall be avoided wherever possible and if installed, shall not exceed 600 feet. Hydrants or line flush unit shall be located at the end of dead-end mains for flushing purposes or for fire protection as the need exists.

8. Each building shall be served by a separate line and meter; however, in some situations a common tap and service line from the main to a manifold with two curb stops and meter boxes may be installed to serve two adjacent properties. Multiple housing of two units or more shall have a minimum of 1" service line. Designer to verify combined flow requirement and size service line accordingly.
9. All service line taps shall be machine tapped at the time of the water main installation. Service lines shall be installed prior to testing and acceptance of the water main.
10. Pressure water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer main. The distance shall be measured edge to edge. For low pressure water mains or other special situations, DDW Rule 309-550-7(3) applies.
11. When a pressure water main crosses over a sewer main, the water main shall be laid at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. When the water main cannot be as high as 18 inches above the sewer, the sewer shall be constructed of material with pressure conduit standards for a distance of 20 feet on either side of the crossing.
12. All tees, bends, plugs and hydrants shall be provided with reaction blocking, tie rods or joints designed to prevent movement. Wood blocking of future main extensions are not acceptable. Concrete thrust blocks shall be formed and poured in place and must bear against undisturbed soil.
13. Air release vacuum valve assemblies and pressure relief valves shall be provided on all water transmission mains where required to prevent damage or flow restriction due to air accumulations or transient pressures.
14. Water Storage Facilities Sizing: In accordance with current DDW Rules, and 1991 Uniform Fire Code.

- a) Provide equalization storage volume to satisfy total system peak day demands for water for indoor and outdoor use.
- b) Provide fire suppression storage volume for a minimum of 2 hours of fire suppression flow (120,000 gallons) for a one- or two-family dwelling less than 3,600 square feet in size. Larger residential structures or commercial buildings require 2 hours of 1,500 gpm (180,000 gallons) minimum.

15. Water Source Facilities Sizing: In accordance with current DDW Rules:

- a) Sources shall legally and physically meet water demands under two separate conditions. First, they shall meet the anticipated water demand on the day of highest water consumption. This is referred to as the peak day demand. Second, they shall also be able to provide one year's supply of water, the average yearly demand.

C. Sanitary Sewer: In accordance with Utah Department of Environmental Quality, Division of Water Quality (DWQ) Rules, and shall be sized to carry flows for the estimated ultimate tributary population or the 50-year planning period, whichever requires a larger capacity.

- 1. General System Design: Use annual average daily flow rate of 100 gallons per capita per day minimum. Place at depth to service basements and prevent freezing. Any pressurized type sewer system, and/or sewer treatment facility shall meet or exceed DWQ Rules and Regulations, and will be approved on an individual basis.
- 2. Utility Separation: Maintain at least 10 feet horizontal separation between culinary water lines and sanitary sewer lines. Where culinary water lines and sanitary sewer lines cross, install culinary water line at least 18 inches above sanitary sewer line. Measure separation distances from outside edge to outside edge of pipe. If separation requirement cannot be met,

special pipe material and joint construction may be approved by County Engineer or UDWQ officials.

3. Sewer Collectors, Interceptors, and Outfall Lines: 8 inch diameter minimum size designed and constructed to give mean velocities of not less than 2 feet per second per DWQ R317-3-2. Uniform slope and straight alignment between manholes. Use following minimum design flow:
 - a) Lateral and Collector: Design for peak flow of 400 gallons per capita per day.
 - b) Interceptor and Outfall: Design for peak flow of 250 gallons per capita per day.
4. Service Lateral Lines: 4 inch diameter minimum size and 2 percent minimum slope. All laterals shall intersect the sewer main on the top third of the sewer main pipe as shown in the standard drawings.
5. Sewer Pipe Size and Minimum Slope: The minimum slopes in the following table may be used where mean daily flow results in $2/3$ full pipe flow. When mean daily design flow results in less than $2/3$ full pipe flow, designer shall design pipe slope such that minimum of 2 feet per second mean velocity is achieved based on Manning's formula using $n=0.013$ or greater.

SEWER SIZE (inches)	MINIMUM SLOPE (ft/100 feet)
4	2.08
6	1.04
8	0.34
10	0.25
12	0.20
15	0.15
18	0.12
21	0.09

Under special conditions, when justifiable reasons are given, slopes slightly less than those required for the two foot per second velocity when flowing 2/3 full may be permitted. Such decreased slopes will only be considered where the depth of flow will be 0.3 of the diameter or greater for the design average flows, and where computations of the depth of flow in such pipes at minimum, average and design. The Engineer must furnish computations for velocities, depth of flow and for thrust restraint design, for grades in excess of 10% and for extremely low flow situations.

6. Minimum Size and Depth: No public sanitary sewer shall be less than eight inches in diameter, except terminal sewers on short cul-de-sacs or private developments which may be six inches in diameter, not to exceed 200 feet in length and limited to the equivalent of one residential units

attached. Minimum size of residential connections shall be four inches in diameter. Minimum size of restaurant connections shall be six inches in diameter. Only one residence, structure, or building shall be served by each lateral connected to the public collector (See Uniform Plumbing Code).

In general, sanitary sewers shall be designed of sufficient depth to permit sewer laterals from basements to be connected. Exceptions may be granted in subdivisions or areas in which houses without basements are to be constructed. In such case a note to that effect shall be made on all plans presented for approval. In no case shall sanitary sewers be designed for a depth of cover less than 6 feet over the top of the sewer pipe. Where shallower depths are unavoidable, it must be demonstrated that required separation from existing and future culinary water lines will be maintained, furthermore, consideration may be given to the construction of a concrete-encased, or similarly protected, sewer, as circumstances may direct. Proper allowance for loads on the sewer shall be made based on width and depth of the trench. All sewers shall be designed to prevent damage from super-imposed loads as well as trench loading conditions. Where necessary, special construction may be required.

7. Service Connections: Service connections to any public sanitary sewer shall be made only to a sanitary tee installed at the time of the sewer main installation or by a machine tap and approved saddle compatible with the main line sewer material in accordance with the drawings shown in the Appendix of these specifications and shall be a minimum of ten feet, measured horizontally, from any culinary water line or tapping. All connections and service lines must be water tight. All sewer clean-outs

shall be made with a standard wye fitting.

All sewer laterals connected to public sewer mains shall conform to the following table:

TYPE OF UNIT OR RESIDENCE	MINIMUM SEWER LATERAL SIZE (Diameter)	MINIMUM SLOPE
Single Family Residences	4 inches	2%
Townhomes	4 inches/unit	2%
Multi-Family Condominiums	6 inches	1%
Commercial Establishments	6 inches	1%
Mobile Homes	4 inches	2%
Apartments	See notes below	

Notes:

1) Lateral size and slope shall be based on the number of fixture units in the apartment, in accordance with the Uniform Building Code.

2) Under no circumstances shall roof drains, foundation drains, storm drains or sub-drains be connected to the sanitary sewer system.

8. Manholes:

- a) Manholes shall be installed at the end of dead-end lines exceeding 150 feet in length; all changes in grade, size, alignment, at all intersections; and spaced no greater than 400 feet for 15 inch

diameter and smaller, and 500 feet for sewers 15 inch diameter to 30 inch diameter.

- b) All manholes shall be accessible to maintenance vehicles, and all sewer easements shall provide at least 10 feet of unobstructed width on both sides of the pipe.
- c) Drop manholes shall be provided for a sewer line entering a manhole at an elevation of 24 inches or more above the manhole invert.
- d) Floor troughs shall be furnished for all sewers entering manholes, and shall be at least as deep as the full diameter of the sewer main in the manhole.
- e) When a smaller sewer main joins a larger sewer main in a manhole. Place the 0.8 depth points of each pipe at the same elevation.
- f) All manholes shall conform to the detailed dimensions, construction details and materials as shown on the drawing entitled "Standard Manhole" as provided in the standard drawings.
- g) Sewer manholes for all sewer mains of 18 inches or less in diameter shall be a minimum of four feet in inside diameter. For sewer mains larger than 18 inches in diameter or over 12 feet in depth, or where three or more 12 inch or greater sewer lines converge, the manholes shall be not less than five feet in inside diameter.
- h) Clean-outs may be substituted for manholes in dead-end lines shorter than 150 feet in length, in a cul-de-sac.

- D. Storm Drainage Design (provide county with storm drainage summary report, including design criteria, calculations, drainage feature sizing, etc.):

1. Storm Water Detention: County officials will decide if storm water detention facilities are required based on downstream development impacts, site soil conditions, long term detention effectiveness, and other factors. If it is determined that storm water detention facilities are necessary, the following design criteria apply:
 - a) Size detention to temporarily detain post development flow from a 10-year frequency event.
 - b) Size detention outlet such that outlet flows will not exceed pre-development 10-year frequency event flows.
2. Storm Water Site Drainage: All development site drainage features (i.e., road and street drainage ditches, open channel flow-ways, culverts, catch basins, flood control drainage tributaries, etc.):
 - a) Size to convey 25-year frequency event, post development flows without causing damage to development site, drainage features or adjacent properties.
3. Flood Control System: Required for all major drainages that run through or adjacent to the development site or that need to be crossed, contained, or in any way modified for the development.
 - a) Size all facilities associated with flood control system to convey 100-year return frequency event, post development flow(s), without causing damage to the development site or drainage features.
 - b) Flood water may be conveyed in pipes, major washes, designated floodway easements, or along dedicated county street drainage ditches. Where open ditches or canals exist within or adjoining a subdivision, the owner shall coordinate with the irrigation company to accommodate safety or flood control needs. Any canal use or modification will require irrigation company approval.

4. All occupied buildings shall be constructed outside of floodway limits and two feet above the 100-year flood stage.
5. Streets may be inverted to carry flood water only with sufficient justification and upon approval of the County Engineer.
6. When designing flood systems, the Engineer shall give proper consideration to adjacent properties. The drainage basin upstream shall be assumed fully developed to conform with the current land use master plan. The impact of said run-off on downstream properties shall also be considered in the design, including acquisition of easements or agreements where necessary.
7. Spring control design may be used to eliminate nuisance overland flow if all appropriate permitting is in place.
8. A Storm Water Pollution Prevention Plan meeting DWQ standards shall be prepared and filed with notice of intent posted prior to any construction activities of the project.

G. Power System. Design and construct in accordance with local electrical utility provider and pertinent electrical code(s) (i.e., NEC, NESC, NEMA, UL):

1. Design: Place at back or front lot lines. Do not place in water or sewer trench.
2. Layout: Provide easements not less than 15 feet wide. Wider easements may be required for commercial and industrial uses. Do not place structures within 10 feet in front of transformer pad or within 18 inches of any other side of transformer pad.
3. Minimum Burial Depth:
 - a) Primary Lines: 48 inches.
 - b) Secondary Lines: 36 inches.
4. Streetlights: Provide in accordance with Section 16.

5. All power system designs shall be approved by Garkane Energy, or current local power utility provider.

H. Phone/Fiber Service:

1. Design shall be in accordance with South Central Communications, or current local power utility provider, or other current local service provider's minimum standards.

I. Natural Gas:

1. Design shall be in accordance with local fuel supplier's minimum standards.

3.2 DRAWINGS

- A. Construction drawings shall be prepared and stamped by engineer licensed in State of Utah. Construction drawings and specifications shall be reviewed and approved by related regulating agency where applicable (i.e., culinary water – DDW, sanitary sewer – DWQ). Construction drawings shall be clear, legible and conform to standard engineering and drafting practices. All drawings shall conform to following:

1. Sheet Size: 24 inch by 36 inch.
2. Have border and title block.
3. Indicate sheet title, project name, preparer's name, engineer's stamp, date, scale, U.S.G.S. elevation datum, north arrow for plans, and sheet number.
4. Use appropriate scale as required to clearly show existing features and proposed improvements.
5. Site and grading plans shall show limits of disturbance as well as run-off mitigation measures and accurate contours. Contour elevation spacing

requirements vary from 5' maximum spacing for mountainous developments to 2' maximum spacing for flatter terrain.

B. Street improvement drawings shall show:

1. Plan and profile.
2. Elevations, grades and dimensions.
3. Stationing and curve data as well as permanent survey monumentation.
4. Curb returns and grades, drainage features, and sidewalks (if any).
5. Cut and fill daylight extent lines.

C. Utility improvement drawings shall show:

1. Location, size and type of utility. Material types and sizes.
2. Plan and profile with elevations and grades for sanitary sewer and storm drain.
3. Connections to existing utilities.
4. All features required by pertinent regulating agencies.

D. Drawings shall include sufficient detail sheets to clearly describe proposed improvements. Details shall be scale drawings with complete dimensions and description of the work.

- E. Submit 2 sets of construction drawings to Kane County for review. If disapproved, one set of construction drawings will be retained by Kane County and 1 set will be returned with reasons for disapproval. If approved, 2 additional sets will need to be submitted, 2 sets of construction drawings will be retained by Kane County and 2 sets of construction drawings will be returned. One of these sets shall be kept on site at all times.
- F. Receipt of approved sets of construction drawings from Kane County shall authorize Developer to proceed with construction. Do not start construction until construction drawings are approved.
- G. Use one set of approved construction drawings to document any changes made during construction. After construction has been completed, submit contract record drawings to Kane County.

3.3 LICENSES AND PERMITS

- A. Owner/Developer shall obtain all licenses, permits, and agency approvals required to complete the Work.
- B. Any and all contractors performing work within Kane County shall be properly licensed and insured for the type of work, and shall furnish proof of Utah licensure. The properly licensed contractor shall be completely responsible for their work.

3.4 TEMPORARY UTILITIES

- A. Provide and pay cost for any required temporary utilities such as but not limited to: electricity, telephone, water, and sanitary facilities.

3.5 BARRIERS AND TRAFFIC REGULATION

- A. Provide barricades, barriers, and signs to prevent unauthorized entry to construction areas, protect existing improvements from damage, and protect public.
- B. Provide warning, detour, and other signs to direct traffic safely through or around construction areas. When working within traffic lanes, close road and detour traffic or use flaggers to direct traffic.
- C. Use flares and lights during hours of low visibility to delineate traffic lanes, guide traffic, and protect public.
- D. Relocate barricades, barriers, signs and other traffic control devices as work progresses to maintain effective traffic control and public protection. Remove when no longer required.

3.6 TESTING DURING CONSTRUCTION

- A. Material testing required by these Construction Standards shall be performed by independent testing laboratory approved by Kane County. All testing shall comply with current AASHTO, ASTM, AWWA or State of Utah standards as indicated.
- B. Cost for testing and bringing materials into compliance shall be borne by Owner/Developer.

- C. Kane County reserves right to perform verification testing to verify test results submitted by Owner/Developer. Verification testing governs over test results submitted by Owner/Developer. Kane County will pay cost for verification testing, unless verification testing reveals unacceptable work, then cost for verification testing and cost for corrective work shall be paid by Owner/Developer.

3.7 INSPECTION

- A. All improvements shall be subject to inspection by Kane County or County's engineer. Do not cover or backfill excavations for improvements until improvements have been inspected by Kane County. If any installation is covered before being inspected and approved, Developer shall uncover installation at no cost to Kane County.
- B. After improvements are completed, Kane County will conduct final inspection or "Construction Completion Inspection". Any faulty or defective work noted at final inspection shall be corrected within 30 calendar days after date of final inspection. If Developer fails to complete corrective work within 30 calendar days, then Kane County will arrange for corrective work to be completed and cost will be billed to Developer.
- C. Requests for inspections shall be made to Kane County at least 24 hours in advance of need for inspection.
- D. Developer shall pay Kane County for cost of inspections.

END OF SECTION

SECTION 2

REMOVAL AND REPLACEMENT OF EXISTING IMPROVEMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for protection, restoration or replacement of existing improvements on public or private property.
- B. Replacing improvements removed or damaged during trenching or other construction operations.

1.2 REFERENCES

- A. Related Sections:
 - 1. Section 4 - Trenching.
 - 2. Section 9 - Untreated Base Course.
 - 3. Section 10 - Asphalt concrete Pavement.
 - 4. Section 11 - Cast-in-Place Concrete.

1.3 DEFINITIONS

- A. Existing Improvements: Include but are not limited to gravel surfacing, asphalt concrete pavement, portland cement concrete pavement, curb, gutter, sidewalk, driveway, fence, ditch, culvert, utility, sign, structure, wall and landscaping.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Untreated Base Course: In accordance with Section 9.
- B. Asphalt Concrete Pavement: In accordance with Section 10.
- C. Portland Cement concrete: In accordance with Section 11.
- D. Other Materials: Match existing materials or better.

PART 3 EXECUTION

3.1 REMOVAL

- A. Remove existing improvements only when necessary to construct proposed improvements.
- B. Remove existing improvements damaged during construction.
- C. When removing asphalt concrete pavement, saw cut through full depth of pavement and in straight line. If pavement is cracked, broken or deteriorated, make cut so defective area is removed. When possible, make saw cut parallel or perpendicular to center line of street. For trenching, make saw cut 6 inches beyond edge of trench.
- D. When removing portland cement concrete, remove back to nearest cold joint or saw cut in straight line beyond damaged area.
- E. Broken asphalt concrete pavement and portland cement concrete may be used as backfill in trenches if broken up small enough to meet requirements of Section 4. Dispose of unusable damaged materials off site.

3.2 REPAIR, RESTORATION AND RECONSTRUCTION

- A. Repair, restore or reconstruct improvements to equal or better condition than existed prior to start of construction.
- B. Replace gravel surfacing with untreated base course to depth equal to existing gravel surfacing, but not less than 6 inches. Place and compact untreated base course in accordance with Section 9. If gravel surfacing is different from untreated base course, replace with material equal to existing.
- C. Replace asphalt concrete pavement and untreated base course in accordance with Sections 10 and 9 respectively. Place untreated base course to depth equal to existing base, but not less than 6 inches. Place asphalt concrete pavement to depth equal to existing pavement, but not less than 2.5 inches.
- D. Replace concrete improvements to match adjacent concrete improvements, unless adjacent improvements do not meet current Kane County Construction Standards, then match current standards.
- E. Restore or replace landscaping improvements.

END OF SECTION

SECTION 3

EARTH WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for excavation, embankment, backfill and compaction for structures and site improvements.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M145 - The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.
 - 2. AASHTO T99 - Moisture-Density relations of Soils Using a 5.5 lb (2.5 kg) Rammer and a 12-in. (305 mm) Drop.
 - 3. AASHTO T180 - Moisture-Density relations of Soils Using a 10-lb. (4.54 kg) Rammer and an 18 in. (457 mm) Drop.
 - 4. AASHTO T193 - California Bearing Ratio.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- C. Occupational Safety and Health Act (OSHA).
- D. Related Sections:
 - 1. Section 9 - Untreated Base Course.
 - 2. Section 11 - Cast-in-Place Concrete.

1.3 DEFINITIONS

- A. Clearing: Removal and disposal of logs, limbs, sticks, vegetation, rubbish, debris, and other material on ground surface.
- B. Grubbing: Removal and disposal of roots, buried logs, debris, and other underground material.
- C. Soil Classification: As determined in accordance with AASHTO M145.

- D. Earthwork: Sterilization of Soils: All roadway areas will have sterilization of the soil to EPA standards and USU Extension recommended products prior to placement of UBC road base or asphalt.

1.4 SUBMITTALS

- A. Test Results: Submit one copy of soil classification, proctor and density test results.

1.5 SITE PREPARATION REQUIREMENTS

- A. Earthwork: All roadway areas will be sterilized to EPA standards and USU Extension recommended products prior to the placement of UBC road base or asphalt.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Granular Borrow: Granular material.
 - 1. Classification: AASHTO M145, A-1-a or A-1-b.
 - 2. CBR Value: AASHTO T193, 20 percent of greater.
 - 3. Gradation: 6 inches maximum.
- B. Borrow: A-1-a through A-4 material as classified in accordance with AASHTO M145.

PART 3 EXECUTION

3.1 PREPARATION

- A. Identify required lines, grades, and elevations.
- B. Locate, identify, and protect utilities that remain from damage.
- C. Set bench marks, control points and other survey stakes as needed to meet tolerances.

3.2 WATER CONTROL

- A. Grade construction area to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect construction areas from puddling or running water. Provide water barriers as required to protect construction areas from soil erosion.

- C. Provide temporary drainage for storm or runoff water. Make repairs to correct any damage caused by temporary or lack of temporary drainage.

3.3 DUST CONTROL

- A. Provide adequate water supply for dust control at any time.
- B. Do not waste water or over saturate construction area.

3.4 CLEARING AND GRUBBING

- A. Clear and grub all vegetation and debris within roadway.
- B. Dispose of material off site.
- C. Backfill holes, cuts, and depressions resulting from clearing and grubbing. Compact to density of surrounding ground.

3.5 EXCAVATION

- A. Excavate soil as necessary to construct improvements. Stockpile excavated soil sufficient distance from edge of excavation to prevent slides and cave-ins. Stockpile soil in manner to minimize inconvenience for traffic and minimize damage to existing improvements.
- B. Remove and dispose of unsuitable excavated materials off site.
- C. Use suitable excavated materials for backfill and embankments. Dispose of surplus materials off site.
- D. Slope bank of excavation to meet soil conditions and OSHA requirements. Under cutting will not be permitted. Where needed, provide shoring.
- E. Excavate subgrade for structure to original undisturbed soil. Correct excavation below subgrade for structure with concrete or untreated base course in accordance with Sections 11 and 9 respectively.

3.6 EMBANKMENT

- A. Use suitable excavated materials to build embankments. Do not use frozen, organic, rubbish, debris, or other objectionable materials.
- B. For embankment with underlying ground consisting of loose material, scarify and compact top 8 inches of ground to at least 92 percent of maximum laboratory density.

- C. Do not place embankment over porous, wet, frozen, or spongy subgrade.
- D. Do not use rocks, concrete or pavement materials over 6 inches in largest dimension. Mix rocks and large material with finer materials to minimize voids.

3.7 OVER EXCAVATION

- A. If soft areas appear, scarify, aerate, and re-compact.
- B. If soft areas persist, excavate unsuitable soil and dispose off site.
- C. Backfill excavated areas with granular borrow and compact.

3.8 BACKFILLING

- A. Use excavated materials to backfill excavated area to match required contours and elevations.
- B. Do not backfill over porous, wet, frozen or spongy subgrade. Remove shoring.
- C. Employ placement method that does not disturb or damage other work.
- D. Slope finish grade away from structure. Make gradual grade changes. Blend slope into level areas.

3.9 BORROW

- A. If quantity of excavated material is not sufficient to complete backfill and embankment, import borrow material as needed.
- B. Use granular borrow for areas subject to traffic and other loads such as roadways, concrete elements and structures.
- C. Use fine grained materials for landscaping and non-traffic areas.
- D. Do not use frozen, organic, rubbish, debris or other objectionable materials.

3.10 COMPACTION

- A. Place backfill and embankment materials in layers not exceeding 12 inches non-compactive depth. If tests indicate unsatisfactory density, reduce layer thickness.

- B. Compact with self-propelled compaction equipment. Use hand-operated compaction equipment in areas inaccessible to self-propelled compaction equipment.
- C. Maintain optimum moisture content of backfill and embankment materials to obtain required density.
- D. Required Subgrade Density:
 - 1. Structures: Original undisturbed soil or engineered fill compacted to 96 percent of maximum laboratory density.
 - 2. Concrete elements including curb, gutter, flatwork and pavement: 96 percent of maximum laboratory density.
 - 3. Traveled areas including roads, shoulders, parking lots, and driveways: 96 percent of laboratory density.
 - 4. Non-traveled areas: 90 percent of maximum density.
 - 5. Any settlement of embankment or backfill shall be corrected at no cost to Kane County.

3.11 FINISHING

- A. Finish excavated areas and embankment to reasonably smooth and uniform surface.
- B. Grade to blend in with existing contours and features and provide positive drainage.

3.12 TOLERANCES

- A. Moisture Content: Plus or minus 2 percent of optimum.
- B. Finish Subgrade Surface: Plus or minus 0.1 feet of required elevation.

3.13 TESTING

- A. Soil Classification: One per material source for granular borrow in accordance with AASHTO M145.
- B. Soil Proctor: One per each significant soil type encountered as necessary to provide density testing. Determine maximum laboratory density in accordance with AASHTO T180, Method D for A-1 soils and AASHTO T99, Method D for other soils.

- C. Density: Perform with nuclear gauge in accordance with ASTM D2922.
 - 1. Frequency:
 - a) Backfill and Embankment: One test per 500 cubic yards.
 - b) Subgrade: One test per 1500 square yards.
 - 2. Acceptance: Density equals or exceeds density requirements of article 3.10. Reject single density tests below required density.
 - 3. If test results are is not acceptable, re-compact and retest.

3.14 PROTECTION

- A. Protect features remaining.
- B. Maintain subgrade until next layer is placed.

END OF SECTION

SECTION 4

TRENCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavating trenches for utilities and utility structures.
- B. Backfilling and compaction for utility trenches.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M145 - The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.
 - 2. AASHTO T99 - Moisture-Density Relations of Soils Using a 5.5-lb (2.5 kg) Rammer and a 12-in. (305 mm) Drop.
 - 3. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and a 18-in. (457 mm) Drop.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- C. Occupational Safety and Health Act (OSHA).
- D. Related Sections:
 - 1. Section 12 - Flowable Fill.

1.3 DEFINITIONS

- A. Soil Classification: As determined in accordance with AASHTO M145.
- B. Utility: Any buried pipe, duct, conduit, cable and appurtenance.

1.4 SUBMITTALS

- A. Test Results: Submit one copy of proctor and density test results.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Backfill:
 - 1. Excavated material free from rubbish, debris, organic material, frozen material, or other objectionable material.
 - 2. Rocks originating from trench and not exceeding 12 inches.
 - 3. Broken portland cement concrete and asphalt concrete pavement originating from trench and not exceeding 6 inches.
 - 4. If excavated material is not suitable for backfill, import granular material.
 - 5. Electrical trenches shall not be backfilled with any rocks exceeding 3 inches in size, broken portland cement concrete or asphalt.
- B. Imported Foundation Material: Crushed rock or gravel with 2 inch maximum gradation.
- C. Bedding: Native or imported soil, sand, gravel, crushed rock or other material not exceeding 3/4 inch maximum particle size. Flowable fill can be used as bedding.

PART 3 EXECUTION

3.1 PREPARATION

- A. Identify required location and elevation of utility lines and structures.
- B. Locate, maintain and protect above and below grade utilities which are to remain.
- C. When working on shoulders or within roadway, place barricades, warning signs, and flag persons as needed to protect public and direct traffic.
- D. When trench is within pavement, saw cut trench prior to trenching.

3.2 EXCAVATION

- A. Excavate soil required for installation of utilities and utility structures.
- B. Cut trenches sufficiently wide to enable installation of utility and utility structure, provide compaction and allow inspection. Cut slope of trench walls to meet Utah State Industrial Commission and OSHA requirements and soil conditions. Provide shoring where needed. Take all necessary precautions to protect personnel in or around excavations.
- C. Remove water from trench. Provide, operate, and maintain pumping equipment as needed.
- D. Hand trim excavation for bell and spigot pipe joints. Remove lumped soil, boulders, rock and other materials that interfere with utility and utility structure.
- E. Correct areas over excavated by backfilling and compacting to 96 percent of maximum laboratory density.
- F. Stockpile excavated material along side of trench or in other areas to minimize damage to improvements.
- G. If unstable soil, mud or muck is encountered which is unsuitable to support utility, remove unsuitable material 12 inches below grade. Backfill with imported foundation material and compact to 96 percent of maximum laboratory density.
- H. When required, install utility by boring, jacking, moleing or augering.
- I. When trench is within existing roadway or other traveled area, place temporary gravel surface in top 6 inches of trench backfill until final surfacing is placed.

3.3 ROCK EXCAVATION

- A. If rocks are encountered which require removal by blasting, notify Kane County.

- B. Comply with laws, ordinances, regulations and safety code requirements for blasting. Exercise care when handling explosives and during blasting. Assume all responsibility for damage and injuries caused by blasting.
- C. In locations where solid rock, ledge rock, and cobble rock are encountered, excavate rock 6 inches below grade. Backfill with material required for utility bedding and compact to 96 percent of maximum laboratory density.

3.4 BACKFILL

- A. Place bedding under, around, and over utility, structure, or appurtenance as necessary and compact.
- B. After utilities, utility structures, appurtenances, and bedding have been installed, backfill trenches. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces. Remove shoring.
- C. Do not place rocks larger than 2.5 inches in backfill placed within 12 inches of pavement subgrade.
- D. Employ placement method that does not disturb or damage utilities and utility structures.
- E. Grade surplus material to blend in with existing contours or remove surplus materials from site if necessary.
- F. Backfill trench as soon as possible. No more than 500 linear feet of open trench permitted. Minimize length of trench left open during night time.
- G. When trench is within existing roadway, backfill with flowable fill in accordance with Section 12.

3.5 COMPACTION

- A. Place backfill in layers not exceeding 12 inches non-compactive depth. If tests indicate unsatisfactory density, reduce layer thickness.
- B. Compact with self-propelled compaction equipment or use hand-operated compaction equipment in areas inaccessible to self propelled compaction equipment.

- C. Maintain optimum moisture content of backfill materials to obtain required density.
- D. Required Density:
 - 1. Class "B" Backfill: 96 percent of maximum laboratory density for traveled areas including roads, shoulders, parking lots, and driveways.
 - 2. Class "D" Backfill: 90 percent of maximum laboratory density for non-traveled areas.

3.6 TOLERANCES

- A. Moisture Content of Backfill: Plus or minus 2 percent of optimum.
- B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1/2 inch from required elevations.
- C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.7 TESTING

- A. Soil Proctor: One per each significant soil type encountered as necessary to provide density testing. Determine maximum laboratory density in accordance with AASHTO T180, Method D for A-1 soils and AASHTO T99, Method D for other soils.
- B. Backfill Density: Perform with nuclear gage in accordance with ASTM D2922.
 - 1. Frequency: Minimum of two random tests per day after roller pattern is established.
 - a) Roller Pattern: Take three random density tests per 6 inch layer for 300 linear foot section of trench. Repeat tests for next layer. Establish roller pattern to obtain required density.
 - 2. Acceptance: Density equals or exceeds density requirements of article 3.5. Reject single density tests below required density.
 - 3. If tests results are not acceptable, re-compact, and retest.

3.8 PROTECTION OF FINISHED WORK

- A. Protect finished Work.
- B. Reshape and re-compact trenches subjected to vehicular traffic during construction. Maintain trench surface flush with adjacent pavement or other surfacing.

END OF SECTION

SECTION 5

CULINARY WATER

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for pipe, fittings, valves, fire hydrants, services, thrust restraint devices and bedding for culinary water lines.
- B. Disinfection and pressure testing for culinary water lines.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M145 - The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.
 - 2. AASHTO T99 - Moisture-Density Relations of Soils Using a 5.5-lb (2.5 kg) Rammer and an 12-in. (305 mm) Drop.
 - 3. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D1248 - Polyethylene Plastics Molding & Extrusion Materials.
 - 2. ASTM D2239 - Polyethylene Plastic Pipe (SDR-PR).
 - 3. ASTM D2241 - Poly (VinylChloride) (PVC) Plastic Pipe (SDR-PR).
 - 4. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 5. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- C. American Water Works Association (AWWA):
 - 1. AWWA C110 - Gray-Iron and Ductile-Iron Fittings, 2 inch Through 48 inch for Water and Other Liquids.
 - 2. AWWA C111 - Rubber-Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe and Fittings.
 - 3. AWWA C502 - Dry Barrel Fire Hydrants.
 - 4. AWWA C509 - Resilient Seated Gate Valves 3 in through 12 in NPS, for Water and Sewage Systems.
 - 5. AWWA C651 - Disinfecting Water Mains.
 - 6. AWWA C800 - Threads for Underground Service Line Fittings.

7. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for water.
 8. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, ½ inch through 3-inch, for Water.
- D. National Sanitation Foundation (NSF):
1. NSF-14 - Standard for Thermoplastic Materials, Pipe, Fittings, Valves, Traps and Joining Materials.
- E. Related Sections:
1. Section 4 - Trenching.
 2. Section 11 - Cast-in-Place Concrete.

1.3 DEFINITIONS

- A. Bedding: Fill placed under, beside, and directly over pipe to 12 inches above top of pipe, prior to subsequent backfill operations.
- B. Soil Classifications: As determined in accordance with AASHTO M145.

1.4 SUBMITTALS

- A. Test Results: Submit two copies of pressure, bacteriological, proctor and bedding density test results.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of Utah Department of Environmental Quality, and where applicable, AWWA Standards.
- B. Kane County Water Conservancy District Standards, if applicable, shall be complied with.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Unload, stockpile and install pipe by mechanical equipment or by hand using method that will not damage pipe. Stockpile pipe in units or crates as shipped. Do not allow pipe to fall to ground or in trench.

PART 2 PRODUCTS

2.1 PIPE

- A. PVC Pipe:
 - 1. AWWA C-900 - blue in color.
 - 2. Bell and spigot joints with elastomeric gaskets in accordance with ASTM F477.
 - 3. Be NSF approved and bear NSF label.
 - 4. Pipe Fittings: Cast iron or ductile iron in accordance with AWWA C110 and rubber gasket joints in accordance with AWWA C111.
- B. Ductile Iron Pipe: Shall be of the proper class and size for the improvements.
- C. HDPE pipe may be used under the proper conditions for transmission lines. Individual projects will be evaluated on a case by case basis.

2.2 VALVES

- A. Gate Valve: AWWA C509, Iron body, bronze trim, non-rising stem with a 2" square operating nut, single wedge, resilient seat, mechanical joint ends. Rated for 200 pounds per square inch working pressure. Valve shall open by turning nut counter-clockwise.
- B. Butterfly Valve: AWWA C504, class 150B, tight-closed rubber seated type. Shall be bubble-tight at rated pressure in either direction and suitable for operation after long periods of inactivity. Provide with mechanical joint ends and rated for 200 pounds per square inch working pressure.
 - 1. Valve Body: Solid ASTM A126, class B, cast iron with ANSI B16.1 flange drilling.
 - 2. Valve Shaft: Solid 18-8, type 304 or type 316 stainless steel, ground and polished.
 - 3. Valve Operator: Traveling nut, self-locking type designed to hold valve in any position without creeping or fluttering. Equipped with mechanical stop-limiting device to prevent over travel of disc. Valve shall open by turning counter clockwise.
- C. Valve Box and Cover: Cast iron, extension sleeve type, word "WATER" cast on cover.
- D. Concrete Collar: Class AA(AE) reinforced concrete in accordance with Section 11.

2.3 FIRE HYDRANTS

- A. Hydrant: AWWA C502, dry barrel type, with minimum 5.25 inch diameter valve seat opening, break-off flange at ground level, drip valve, 200 psi working pressure, 4.5 feet minimum burial depth. Shall open by turning pentagon operating nut counter-clockwise. Hydrants must be a minimum of 30" in height. Kane County Water Conservancy District hydrants shall be Kennedy or approved equal. Hydrants in high elevations shall be 6 foot minimum bury.
- B. Hose and Steamer Connection: Two 2.5 inch hose nozzles and one 4.5 inch pumper nozzle with standard threads, caps, gaskets and attaching chains.
- C. Finish: Primer and two coats of red enamel.

2.4 SERVICES

- A. Tap Saddle:
 - 1. Nylon coated saddle with stainless steel straps.
 - 2. Provide full support around circumference of pipe.
 - 3. Provide 2 inch minimum bearing area along pipe.
 - 4. Not have lugs which will dig into pipe.
 - 5. Not have U-bolt type strap.
- B. Corporation Stop: Ballcorp style, bronze body in accordance with AWWA C800. Standard iron pipe threads, compression type fittings for polyethylene pipe and stainless steel inserts stiffeners. Copper tubing shall have flare type fittings.
- C. Service Line:
 - 1. High density polyethylene pipe, 200 psi, iron pipe size, in accordance with ASTM D1248, ASTM D2239, NSF-14, and AWWA C901 with stainless steel insert stiffeners.
 - 2. Copper tubing, type K soft, conforming to ASTM B88-62.
 - 3. Minimum of 5 feet of cover required in high elevations.
- D. Service Meter:
 - 1. Copper Setter: 18" height, shutoff valve on inlet, dual check valve outlet.
 - 2. Meter: Badger meter for 2 inch and smaller. If larger than 2 inches, consult water supplier. Shall be adaptable as necessary for Kane County Water Conservancy District.
 - 3. Meter Barrel: High density polyethylene, white.

4. Meter Ring and Lid: Cast iron with words "WATER METER" cast on lid.
 5. Optional, in high elevations, a fully pre-assembled Mueller/McCullough thermal-coil meter box or approved equal having a bury depth of 6 feet.
- E. Fittings: Bronze.
- F. Tracer Wire: 14 ga. solid copper, suitable for direct burial and waterproof splice connections. Wire shall be secured at the surface at all hydrants inside all meter barrels, and in tops of valves as applicable. 12 ga. Wire required for Kane County Water Conservancy District.

2.5 ACCESSORIES

- A. Thrust Restraint Devices:
1. Concrete Thrust Blocks: Class B or B(AE) concrete in accordance with Section 11.
 2. Mechanical Restrained Joints:
 - a) Pipe: Bell and spigot joint restraint harness or clamp. Rated at pressure class of pipe or greater.
 - b) Pipe Fittings: Mechanical joint with restrained follower gland. Rated at pressure class of pipe or greater. Megalug as manufactured by EBAA Iron Sales, Inc. or approved equal.
- B. Bedding:
1. Excavated materials consisting of earth, loam, sandy clay, sand, and gravel which are free from clods of earth, rocks larger than 3/4 inch, frozen material, organic material and debris.
 2. Imported bedding consisting of pitrun gravel, crushed rock, or sand with 3/4 inch maximum size gradation.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify location, depth, material, and size of existing water lines.
- B. Trenching shall be in accordance with Section 4. Hand trim excavation for accurate placement of pipe.
- C. Remove large rocks or other hard matter which could damage pipe or impede installation.

3.2 INSTALLATION

- A. Install pipe and fittings in accordance with manufacturer's recommendations. Seal joints watertight. Route pipe in straight line. All main line and service will have a tracer wire installed in alignment with pipe. STD. Drw. No. W1, W3, W8, 14 ga. wire.
- B. Set valve on solid bearing. Center and plumb valve box over valve. Set top of valve box flush with finished grade. When within improved roadway, construct concrete collar at finish grade of valve box. Main line valves to be installed on property lines.
- C. Set fire hydrant on solid bearing and plumb. Locate pumper nozzle perpendicular to and facing roadway. Install valve next to fire hydrant and place valve box to finish grade. Provide drainage rock around fire hydrant drain.
- D. Install service line and connect to water main and copper setter. Install meter on public side of property line and within 2 feet of property line. Install meter barrel plumb and lid flush with finish ground.
- E. Install thrust restrain devices at any change of pipe direction, fittings and fire hydrant. Install mechanical restrained joints in accordance with manufacturer's recommendations. Thrust restraints shall be one of following methods:
 - 1. Install mechanical joint restraint on all joints of fitting and install concrete thrust block, or
 - 2. Install mechanical joint restraint on all joints of fitting and install restraint harness or clamp on pipe joints for required length.
- F. If excavated material is unsuitable for bedding, import granular bedding. Place bedding at sides and over pipe in layers not exceeding 6 inches compacted depth. Place bedding to minimum compacted thickness of 12 inches above top of pipe.
- G. Compact bedding to 96 percent of maximum laboratory density. Maintain moisture content of bedding material within plus or minus 2 percent of optimum to attain required density.

3.3 WATER PIPING DISINFECTION

- A. After completing pressure testing, flush pipe to remove dirt or other foreign objects.

- B. Add liquid chlorine or liquid calcium hypochlorite to pipe to obtain 50 ppm concentration of chlorine. Maintain 25 ppm chlorine residual at the end of 24 hours. Disinfection procedures shall comply with Utah State Rules for Public Drinking Water Systems, Part II, and AWWA C651.
- C. Flush chlorinated water from pipe. Dispose of discharged chlorinated water in acceptable manner and in conformance with rules of Utah Water Quality Board (See R317 of Administrative Code), and/or AWWA Standards.

3.4 TESTING

- A. Pressure Test: Test water mains at lesser of 200 psi or pressure rating of pipe. Test shall be witnessed by representative of the Kane County Engineer, or Kane County Water Conservancy District, as applicable.
 - 1. Fill pipe with water and place under slight pressure for at least 48 hours.
 - 2. Bring pipe pressure to test pressure and maintain for 4 hours minimum.
 - 3. Provide accurate means for measuring quantity of water needed to maintain test pressure on pipe for test period.
 - 4. If volume of water added to pipe is 10 gallons per inch of pipe diameter per mile of pipe per 24 hours or less, pipe passes test.
 - 5. If pipe does not pass test, find source of leakage, repair or replace, and retest. Repeat until pipe passes test.
 - 6. Test HDPE pipe lines according to manufacturer's recommendations.
- B. Bacteriological Test: After flushing chlorinated water from water lines, take sample for bacteriological test. If necessary, re-chlorinate until satisfactory bacteriological test is obtained. Do not put piping into service until test results are satisfactory.

The following testing protocol is listed in ANSI/AWWA Standard C651.

- 1. Collect two samples from the new pipeline taken at least 24 hr apart.
- 2. Collect a sample from at least every 1,200 ft (366 m) of new main.
- 3. Collect a sample from the end of the line and at least one from each branch.
- 4. Test samples for total coliform bacteria in accordance with *Standard Methods for the Examination of Water and Wastewater*. Additional tests may be required including: chlorine residual, turbidity, pH, and heterotrophoc plat count (HPC).

5. *Special Condition.* Collect additional samples at intervals of approximately 200 ft (61 m) if trench water has entered the new main during construction or if excessive quantities of dirt or debris have entered the new main. Take samples of water that has stood in the new main for at least 16 hr after final flushing.
 6. Collect samples in sterile bottles treated with sodium thiosulfate as required by *Standard Methods for the Examination of Water and Wastewater*. Do not use hose or fire hydrants for the collection of samples. Ensure that there is no water in the trench up to the connection for sampling. Use a clean and disinfected sampling pipe that has been flushed prior to sampling. A corporation cock may be installed in the main with a copper tube gooseneck assembly. This assembly can be removed after sampling and used again.
 7. If the HPC test results are greater than 500 colony-forming units (cfu) per mL, flush and collect a repeat sample until no coliforms are present and HPC is below 500 cfu/mL.
 8. Coliform bacteria must be absent from the samples and the bacteriological quality of the water equal to or better than that of the distribution system.
 9. If unsatisfactory test results are obtained, flush the main again and resample. If check samples also fail to produce acceptable results, rechlorinate the main by the continuous-feed or slug method until two consecutive sets of acceptable tests are taken at least 24 hr apart. In some cases, it may be necessary to pig or pressure wash the pipe prior to rechlorinating the main. It is advisable to check the quality of the water entering the new main because high velocities used for flushing may have disturbed sediment in the supply piping and resulted in poor quality feed water.
- C. Bedding Soil Proctor: One per each significant soil type encountered as necessary to provide density testing. Determine maximum laboratory density in accordance with AASHTO T180, Method D for A-1 soils and AASHTO T99, Method D for other soils.
- D. Bedding Density: Perform with nuclear gage in accordance with ASTM D2922.
1. Frequency: One random test per 500 linear feet of trench.
 2. Acceptance: Density is 96 percent or greater. Reject single tests less than 96 percent.
 3. If tests are not acceptable, recompact and retest.

3.5 PROTECTION

- A. Protect pipe from damage or displacement.
- B. Prevent mud, silt, gravel, and other foreign materials from entering pipe and keep off joint surfaces.
- C. Install plug in pipe end when pipe laying is not in progress.

3.6 STORAGE RESERVOIRS

- A. Construct storage reservoirs in accordance with stamped engineered drawings and specifications (if part of project).
- B. Design and construction practices shall be in harmony with generally accepted procedures and shall be project specific.
- C. After reservoirs are constructed, cleaned, and flushed, they shall be leak tested prior to backfilling. Visible leaks shall not be allowed. Volumetric leak testing shall be completed in such a manner as to reservoir construction materials dictate.
- D. Disinfect reservoir in accordance with UDEQ and AWWA Standards.
- E. After disinfection and flushing, water from the storage facility must be sampled. It shall be tested for total coliform bacteria according to the latest edition of *Standard Methods for the Examination of Water and Wastewater* (chlorine residual, free and combined, is tested to verify conformance with the chlorination requirements and to restore the water to potable quality). If the test is negative for total coliform, the facility can be released and placed into service. If the test is positive for total coliform, repeated samples shall be taken until two consecutive samples (taken 24hr apart) are negative. The facility may be rechlorinated as necessary and then tested again for total coliform as previously described.

Samples should be taken from a sample tap on the outlet piping or from a sample tap that is directly connected to the facility. The water drawn from the tap must represent the water within the facility. Additional samples may be advisable to ensure uniform disinfection results. Storage facility hatches are suitable for this purpose. It is recommended to sample the facility fill-water to make sure it does not contain total coliform bacteria.

END OF SECTION

SECTION 6

SANITARY SEWER

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for sanitary sewer pipe, fittings, accessories and bedding.
- B. Cleaning and testing requirements for sanitary sewer pipe.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M145 - The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.
 - 2. AASHTO T99 - Moisture-Density Relations of Soils Using a 5.5-lb (2.5 kg) Rammer and an 12-in. (305 mm) Drop.
 - 3. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.
- B. American Society of Testing and Materials (ASTM):
 - 1. ASTM D1248 - Polyethylene Plastics Molding & Extrusion Materials.
 - 2. ASTM D1784 - Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
 - 3. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
 - 4. ASTM D2321 - Underground Installation of Flexible Thermoplastic Sewer Pipe.
 - 5. ASTM D2412 - External Loading Properties of Plastic Pipe by Parallel - Plate Loading.
 - 6. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 7. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 8. ASTM F477 - Elastomeric Seals (Gaskets) for joining plastic pipe.

- C. UNI-BELL PVC Pipe Association (UNI-B):
 - 1. UNI-B-6 - Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.
- D. Related Sections:
 - 1. Section 4 - Trenching.

1.3 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe to 12 inches above top of pipe, prior to subsequent backfill operations.
- B. Soil Classification: As determined in accordance with AASHTO M145.

1.4 SUBMITTALS

- A. Test Results: Submit one copy of proctor, bedding density, pressure and deflection test results.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of Utah Department of Environmental Quality.

1.6 DELIVERY STORAGE AND HANDLING

- A. Unload, stockpile and install pipe by mechanical equipment or by hand using method that will not damage pipe. Stockpile in units or crates as shipped. Do not allow pipe to fall to ground or in trench.

PART 2 PRODUCTS

2.1 PIPE

- A. PVC Gravity Sewer Pipe:
 - 1. ASTM D3034.
 - 2. PVC material conforming to ASTM D1784.
 - 3. Minimum pipe stiffness of 46 psi according to ASTM D2412.
 - 4. SDR of 35.
 - 5. Joints: Bell and spigot style with elastomeric gaskets conforming to ASTM F477.

- B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
- C. Alternate pipe and fittings types shall be evaluated on a case by case basis.

2.2 ACCESSORIES

- A. Bedding:
 - 1. Excavated materials consisting of earth, loam, sandy clay, sand, and gravel which are free from clods of earth, rocks larger than 1.5 inch, frozen material, organic material and debris.
 - 2. Imported bedding consisting of pitrun gravel, crushed rock, or sand with 1.5 inch maximum size gradation.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify Location, depth, material, and size of existing sanitary sewer lines.
- B. Trenching shall be in accordance with Section 4. Hand trim excavations to required elevations.
- C. Remove large rocks or other hard matter which could damage pipe or impede installation.

3.2 INSTALLATION

- A. Install pipe, fittings, and accessories in accordance with ASTM D2321 and manufacturer's instructions. Seal joints watertight.
- B. Install gravity sewer pipe using laser equipment. Lay pipe at constant slope between manholes.
- C. Install cleanout plumb. Install top of cleanout flush with finish ground surface.
- D. If excavated material is unsuitable for bedding, import granular bedding. Place bedding at sides and over top of pipe in lifts not exceeding 6 inches compacted depth. Place bedding to minimum compacted thickness of 12 inches above top of pipe.

- E. Compact bedding to 96 percent of maximum laboratory density. Maintain optimum moisture content to attain required density.
- F. Flush sewer pipe clean with water or other approved method. Prevent dirt and debris from entering existing sewer lines in service. Remove dirt and debris from pipe.

3.3 TOLERANCES

- A. Pipe Invert: Plus or minus 0.04 feet. Level or reverse gradients not permitted. Minimum slopes shall be as required by Utah Department of Environmental Quality.
- B. Moisture Content of Bedding: Plus or minus 2 percent of optimum.

3.4 TESTING

- A. Bedding Soil Proctor: One per each significant soil type encountered as necessary to provide density testing. Determine maximum laboratory density in accordance with AASHTO T180, Method D for A-1 soils and AASHTO T99, Method D for other soils.
- B. Bedding Density: Perform with nuclear gage in accordance with ASTM D2922.
 - 1. Frequency: One random test per 500 linear feet of trench.
 - 2. Acceptance: Density is 96 percent or greater. Reject single tests less than 96 percent.
 - 3. If tests are not acceptable, re-compact and retest.
- C. Low Pressure Air Test: Perform in accordance with UNI-B-6.
 - 1. Perform on each section of main pipe line and service pipe line between manholes.
 - 2. Perform after sewer line has been backfilled and cleaned.
 - 3. Cap and brace all wyes, tees, and lateral stubs to withstand test pressures.
 - 4. Plug pipe in manholes or at ends of pipe.
 - 5. Use accurate gauge to measure internal gauge pressure in tenths of pounds per square inch. Test pressures are measured as gauge pressure.
 - 6. Determine required time for test for sewer line based on length and size of pipe shown in Table 6-1.

7. Before starting air test, determine groundwater level. If groundwater level is below sewer pipe invert, perform test at air pressure indicated in subparagraphs 8, 9, & 10. If groundwater level is above sewer pipe invert, increase air pressure for test. Calculate required air pressure for test as follows:
 - a) Determine average vertical height in feet of groundwater above sewer pipe invert.
 - b) Divide vertical height by 2.31. Result is air pressure correction in pounds per square inch.
 - c) Add air pressure correction to normal starting pressure of 3.5 pounds per square inch to determine air pressure for test.
 - d) Do not exceed 9 pounds per square inch for starting test pressure.
8. Slowly introduce low pressure air into pipe until internal air pressure reaches 4.0 pounds per square inch.
9. After constant pressure of 4.0 pounds per square inch is reached, throttle air supply for at least 2 minutes to allow air temperature to equalize.
10. When temperature has equalized and pressure has stabilized at 4.0 pounds per square inch or any convenient pressure between 4.0 to 3.5 pounds per square inch, start timing with stop watch.
11. Record drop in pressure for test period.
12. If pressure drop is 0.5 pound per square inch or less during test period, sewer line passes test.
13. If pressure drop is greater than 0.5 pound per square inch during test period, sewer line fails test. Find source of leakage, repair or replace, and retest. Repeat test until sewer line passes test.

TABLE 6-1
MINIMUM SPECIFIED TIME REQUIRED FOR
0.5 PSIG PRESSURE DROP
FOR SIZE AND LENGTH OF PIPE INDICATED FOR
Q=0.0015 cf/min/sf

Pipe Length	Nominal Pipe Size						
	4"	6"	8"	10"	12"	15"	18"
50	1:53	2:50	3:47	4:43	5:40	7:05	8:30
75	1:53	2:50	3:47	4:43	5:40	7:05	8:30
100	1:53	2:50	3:47	4:43	5:40	7:05	8:30
125	1:53	2:50	3:47	4:43	5:40	7:05	8:30
150	1:53	2:50	3:47	4:43	5:40	7:05	9:37
175	1:53	2:50	3:47	4:43	5:40	7:47	11:13
200	1:53	2:50	3:47	4:43	5:42	8:54	12:49
225	1:53	2:50	3:47	4:43	6:25	10:01	14:25
250	1:53	2:50	3:47	4:57	7:07	11:08	16:02
275	1:53	2:50	3:47	5:26	7:50	12:15	17:38
300	1:53	2:50	3:48	5:56	8:33	13:21	19:14
325	1:53	2:50	4:07	6:26	9:15	14:28	20:50
350	1:53	2:50	4:26	6:55	9:58	15:35	22:26
375	1:53	2:50	4:45	7:25	10:41	16:42	24:02
400	1:53	2:51	5:04	7:55	11:24	17:48	25:38
425	1:53	3:01	5:23	8:24	12:06	18:55	27:15
450	1:53	3:12	5:42	8:54	12:49	20:02	28:51
475	1:53	3:23	6:01	9:24	13:32	21:09	30:27
500	1:53	3:34	6:20	9:54	14:15	22:16	32:03
525	1:53	3:44	6:39	10:23	14:57	23:22	33:39
550	1:53	3:55	6:58	10:53	15:40	24:29	35:15
575	1:53	4:06	7:17	11:23	16:23	25:36	36:51
600	1:53	4:16	7:36	11:52	17:05	26:43	38:28

- D. Deflection Test:
1. Test main sewer pipe lines by one of following methods:
 - a) Deflectometer which produces continuous record of pipe deflection.
 - b) Mandrel go/no-go device with diameter set at 95 percent of nominal pipe diameter.
 2. No mechanical pulling devices permitted.
 3. Complete test after backfill has been in place for minimum of 14 days.
 4. If ring deflection is 5 percent or less of pipe diameter, sewer pipe passes test.
 5. If ring deflection is greater than 5 percent of pipe diameter, sewer pipe fails test. Relay or replace pipe and retest after 30 day period. Repeat test until pipe passes test.
- E. Closed Circuit TV Inspection:
1. Kane County reserves right to visually inspect interior of sewer pipe mains using television camera following deflection test and prior to one year warranty.
 2. Correct defects found by inspection.
 3. Kane County will pay costs for initial TV inspection. Additional TV inspections required because of defects shall be paid by Developer.

3.5 PROTECTION

- A. Protect pipe from damage or displacement.
- B. Prevent mud, silt, gravel and other foreign materials from entering pipe and keep off joint surfaces.
- C. Install plug in pipe end when pipe laying is not in progress.

END OF SECTION

SECTION 7

MANHOLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Precast concrete manholes, frame and cover and accessories.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A48 - Gray Iron Castings.
 - 2. ASTM C361 - Reinforced Concrete Low Head Pressure Pipe.
 - 3. ASTM C443 - Joints for Circular Concrete and Culvert Pipe Using Rubber Gaskets.
 - 4. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
 - 5. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
- B. Related Sections:
 - 1. Section 4 - Trenching.
 - 2. Section 11 - Cast-in-Place Concrete.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 .
 - 1. Precast reinforced concrete base with invert channels and pipe openings monolithic-poured.
 - 2. Concentric with eccentric cone top section.
 - 3. Male/female ends.
 - 4. Watertight joints with pre-lubricated rubber gaskets conforming to ASTM C361 and C443 or mastic sealant.
 - 5. Inside Diameter: 4 feet minimum.
- B. Steps: Fiberglass or steel encased in copolymer polypropylene, placed inside manhole with 12 inch vertical spacing.
- C. Manhole Frame and Cover: Conform to ASTM A48, Class 30B Cast Iron.
 - 1. H-20 traffic load bearing.
 - 2. Machined flat bearing surface.

3. Removable lid with word "SEWER" or "STORM SEWER" cast on top.
 4. Use vented cover unless approved otherwise.
 5. D&L Supply Model A-1180 or approved equal.
 6. Non-SKID surface with cross hatch pattern.
- D. Rubber Boot Couplers: Conform to ASTM C923 and have stainless steel pipe clamp.
- E. Grade Rings: Reinforced precast concrete in accordance with ASTM C478.
- F. Granular Base: Granular material, well graded with 1/4 inch minimum to 1 inch maximum size aggregate, 8" depth.
- G. Dust Pan: Non-corrosive, durable material.
- H. Grout: Nonshrinkage and high strength.
- I. Concrete Collar: Class AA(AE) reinforced concrete in accordance with Section 11.

PART 3 EXECUTION

3.1 PREPARATION

- A. Trenching shall be in accordance with Section 4.

3.2 INSTALLATION

- A. Place and compact granular base to 96 percent of maximum laboratory density.
- B. Place manhole sections plumb, level, and to correct elevation. Install rubber gaskets or mastic at manhole joints. Install manhole watertight.
- C. Install pipe in rubber boot coupler and secure with adjustable pipe clamp. Seal joints watertight.
- D. Install grade rings as required. Use no more than 2 grade rings to establish finish grade elevation. Use flexible sealant on grade ring joints.
- E. Set frame and cover flush to match finish grade elevation. When within improved roadway, construct concrete collar at finish grade of manhole frame and cover.

3.3 TOLERANCES

- A. Manhole Invert Elevation: Plus or minus 0.04 feet from required elevation.

END OF SECTION

SECTION 8

DRAINAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for pipe culverts, fittings, structures and accessories for drainage or irrigation purposes.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M36 - Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains.
 - 2. AASHTO M145 - The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.
 - 3. AASHTO T99 - Moisture-Density Relations of Soils Using a 5.5-lb (2.5 kg) Rammer and an 12-in. (305 mm) Drop.
 - 4. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- C. Related Sections:
 - 1. Section 4 - Trenching.
 - 2. Section 11 - Cast-in-Place Concrete.

1.3 DEFINITIONS:

- A. Bedding: Fill placed under, beside, and directly over pipe to 12 inches above top of pipe, prior to subsequent backfill operations.
- B. Soil Classification: As determined in accordance with AASHTO M145.

1.4 SUBMITTALS

- A. Test Results: Submit one copy of concrete, proctor and bedding density test results.

PART 2 PRODUCTS

2.1 PIPE

- A. Corrugated Steel Pipe and Pipe-Arch: AASHTO M36, nominal size indicated on drawings, minimum 16 gage.
- B. Coupling Bands: Galvanized steel, with two neoprene "O" ring gaskets, galvanized steel bolts, watertight.
- C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in configurations required.
- D. Bedding:
 - 1. Excavated material consists of earth, loam, sandy clay, sand, and gravel which are free from clods of earth, rocks larger than 1.5 inch, frozen material, organic material and debris.
 - 2. Imported bedding consisting of pit-run gravel, crushed rock, or sand with 1.5 inch maximum size.
- E. Corrugated High Density Polyethylene Pipe: Use only HDPE with smooth lining, gasketed spigot and bell ends. Conform to AASHTO M294 and ASTM D3350.

2.2 STRUCTURES

- A. Concrete: Class AA(AE) in accordance with Section 11 or pre-cast reinforced concrete.
- B. Reinforcing Steel: In accordance with Section 11.
- C. Granular Base: Crushed rock, 1 inch maximum size.
- D. Catch Basin Grate and Frame: Steel construction, bicycle safe, hot dip galvanized after fabrication. D&L Supply Model I-1805 or approved equal.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify location and elevation of improvements.
- B. Trenching shall be in accordance with Section 4. Hand trim excavation for accurate placement.
- C. Remove large rocks or other hard matter which could damage pipe or structures.

3.2 INSTALLATION

- A. Install pipe and fittings in accordance with manufacturer's instructions. Install pipe starting at downstream end. Secure joints water tight.
- B. Place and compact granular base for structure. Form and place cast-in-place concrete structure or place precast concrete structure.
- C. After structure has sufficient strength, place backfill around structure.
- D. Cut end of pipe culverts flush with inside of structure walls. Coat cut edge with zinc-dust, or zinc-oxide primer conforming to Federal Specification TT-P-641, for steel pipes.

3.3 TESTING

- A. Bedding Soil Proctor: One per each significant soil type encountered as necessary to provide density testing. Determine maximum laboratory density in accordance with AASHTO T180, Method D for A-1 soils and AASHTO T99, Method D for other soils.
- B. Bedding Density: Perform with nuclear gage in accordance with ASTM D2922.
 - 1. Frequency: One random test per 500 linear feet of trench.
 - 2. Acceptance: Density is 96 percent or greater. Reject single tests less than 96 percent.
 - 3. If tests are not acceptable, re-compact and retest.
- C. Concrete: In accordance with Section 11.

3.4 PROTECTION

- A. Protect pipe and structures from damage or displacement.

END OF SECTION

SECTION 9

UNTREATED BASE COURSE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Untreated base course.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO T11 - Amount of Material Finer Than 0.075 mm Sieve in Aggregate.
 - 2. AASHTO T19 - Unit Weight and Voids in Aggregate.
 - 3. AASHTO T27 - Sieve Analysis of Fine and Coarse Aggregates.
 - 4. AASHTO T90 - Determining the Plastic Limit and Plasticity Index of Soils.
 - 5. AASHTO T96 - Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine.
 - 6. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb.(4.54 kg) Rammer and an 18-in. (457mm) Drop.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- C. Related Sections:
 - 1. Section 13 - Concrete Curb, Gutter and Flatwork.

1.3 DEFINITIONS

- A. Mean of Deviations: Sum of absolute values of deviations from job-mix gradation divided by number of samples.
- B. Lot: One day's production.

1.4 SUBMITTALS

- A. Prior to Production:
 - 1. Identification of Aggregate Source.
 - a) New Source: Submit results of tests required in Article 2.1 of this Section.

- b) Previously Approved Source: Submit evidence that source has been approved by Utah Department of Transportation.
 2. Job-Mix Gradation: Submit gradation indicating single values within band for each sieve size shown on Table 9-1.

B. Changes to Job-Mix Gradation: Submit in writing prior to start of day's production. Changes are subject to approval. Retroactive changes are allowed only for first day's production.

C. Test Results: Submit one copy of proctor, density and gradation test results.

1.5 QUALITY ASSURANCE

A. Obtain materials from same source throughout.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Untreated Base Course: Natural gravel, crushed rock or crushed slag meeting following requirements:
1. Aggregate Passing No. 40 Sieve: AASHTO T90, non-plastic.
 2. Wear: AASHTO T96, not exceed 50 percent.
 3. Dry-Rodded Unit Weight: AASHTO T19, not less than 75 pounds per cubic foot.
 4. Gradation: AASHTO T27 & T11, 3/4 or 1 inch maximum per Table 9-1.

Table 9-1 Gradation Limits		
Sieve Size	Percent Passing of Total Aggregate (Dry Weight)	
	3/4 inch	1 inch
1 inch	-	100
3/4 inch	100	-
1/2 inch	-	79-91
3/8 inch	78-92	-
No. 4	55-67	49-61
No. 16	28-38	27-35
No. 200	7-11	7-11

PART 3 EXECUTION

3.1 PREPARATION

- A. Correct irregularities in subgrade gradient and elevation by scarifying, reshaping, and recompact.
- B. Do not place untreated base course on soft, muddy, or frozen surfaces.
- C. Do not place untreated base course until subgrade is accepted.

3.2 AGGREGATE PLACEMENT

- A. Spread untreated base course over prepared subgrade.
- B. Maintain optimum moisture content of untreated base course. If excess water is apparent, aerate to reduce moisture content. If too dry, add water and mix uniformly.
- C. Place aggregate in maximum 6 inch compacted layers.
- D. If untreated base course is placed in successive layers, do not place next layer until previous layer has been tested and accepted.
- E. Level and contour surfaces to require elevations and gradients.
- F. Compact with self-propelled compaction equipment. Use hand-operated compaction equipment in areas inaccessible to self-propelled compaction equipment.

3.3 TOLERANCES

- A. Moisture Content: Plus or minus 2 percent of optimum.
- B. Compacted Thickness: Plus or minus ½ inch. If thickness exceeds tolerance, remove excess material and re-compact. If thickness is less than tolerance, scarify, add material, and recompact.
- C. Surface Smoothness: Plus or minus 3/8 inch measured with 10 foot straight edge or string line or string line.
- D. Gradation: In accordance with Table 9-2.

Table 9-2 TOLERANCE LIMITS FOR GRADATION					
Sieve Size	MEAN OF DEVIATIONS FROM JOB-MIX GRADATION				
	1 Sample	2 Samples	3 Samples	4 Samples	5 Samples
½ inch and larger	0-15	0-12.1	0-10.8	0-10.0	0-9.5
3/8 inch	0-15	0-11.5	0-9.8	0-8.8	0-8.0
No. 4	0-14	0-10.5	0-8.8	0-7.8	0-7.0
No. 16	0-11	0-8.2	0-6.9	0-6.2	0-5.6
No. 200	0-4.5	0-3.4	0-2.9	0-2.5	0-2.3

3.4 TESTING

- A. Proctor: One per job-mix gradation. Determined maximum laboratory density in accordance with AASHTO T180, Method D.
- B. Density: Perform with nuclear gage in accordance with ASTM D2922.
 1. Frequency: Minimum of 1 random test for each subplot of 600 square yards.
 - a) Roadway: Take minimum of 1 random test for each subplot of 600 square yards.
 - b) Curb and Gutter and Flatwork: Take minimum of 1 random test for each 200 linear feet.
 2. Acceptance: Density is 96 percent or greater for each lot. Reject tests less than 96 percent.
 3. If tests are not acceptable, recompact, and retest.
- C. Gradation: Perform in accordance with AASHTO T27 and T11.
 1. Frequency: Random samples from winrow or on grade prior to compaction in accordance with Table 9-3.
 2. Acceptance: Mean of deviation for each sieve size meets tolerances indicated in Table 9-2 for each lot.
 3. If tests indicate material exceeds tolerances, remove and replace untreated base course or blend with additional untreated base course to meet tolerances.

Table 9-3 GRADATION SAMPLING	
Lot (tons)	Minimum No. of Samples
Greater than 2,500	4
1,500 to 2,500	3
Less than 1,500	2

3.5 PROTECTION

- A. Maintain untreated base course until surface course is placed.

END OF SECTION

SECTION 10

ASPHALT CONCRETE PAVEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for asphalt concrete pavement.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M140 - Emulsified Asphalt.
 - 2. AASHTO M226 - Viscosity Graded Asphalt Cement.
 - 3. AASHTO M303 - Lime for Asphalt Mixtures.
 - 4. AASHTO T19 - Unit Weight and Voids in Aggregate.
 - 5. AASHTO T90 - Determining the Plastic Limit and Plasticity Index of Soils.
 - 6. AASHTO T96 - Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine.
 - 7. AASHTO T104 - Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
 - 8. AASHTO T176 - Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test.
 - 9. AASHTO T30 - Mechanical Analysis of Extracted Aggregate.
 - 10. AASHTO T308 - Determining Bitumen Content in Hot Mixed Paving Mixture and Pavement Samples by the Ignition Method.
- B. The Asphalt Institute (TAI):
 - 1. TAI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.

1.3 DEFINITIONS

- A. Mean of Deviations: Sum of absolute values of deviations from mix design divided by number of samples in lot.
- B. Lot: One day's production.

1.4 SUBMITTALS

- A. Aggregate Source: If not previously UDOT approved, submit test results showing aggregate meets requirements of Article 2.1 paragraph A.3.
- B. Mix Design: Submit at least 10 days before paving begins.
 - 1. Include all test data used to develop mix design.
 - 2. Indicate single value for percentage of aggregate passing each sieve and asphalt cement content.
 - 3. Submit changes in writing prior to production.
- C. Test Results: Submit one copy of density, gradation, and asphalt content test results.

1.5 QUALITY ASSURANCE

- A. Obtain materials from same source throughout.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt concrete pavement when ambient air or base surface temperature in shade is less than 50 degrees F.
- B. Do not place asphalt concrete pavement when base has free surface water or is over saturated.
- C. Do not place asphalt concrete pavement during adverse weather conditions such as rain or fog.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Asphalt Concrete Pavement:
 - 1. Asphalt Cement: AC10 in accordance with AASHTO M226, Table 2, or approved equal.
 - 2. Hydrated Lime: AASHTO M303, use minimum 1% of dry weight of aggregate.
 - a) Chemical Limits:
 - 1. Hydrated Alkalinity: Minimum 90 percent by weight CaCO_3 .
 - 2. Hydrated Lime Content: Maximum 7 percent by weight CaO .
 - 3. Free Water Content: Maximum 3 percent by weight.

- b) Physical Requirements:
 - 1. Residue Retained on No. 30 Sieve: Maximum 2 percent by weight.
 - 2. Residue Retained on No. 200 Sieve: Maximum 12 percent by weight.
- 3. Aggregate: Natural gravel, crushed rock, or slag with uniform density and quality. Gradation per Table 10-1.
 - a) Course Aggregate: Clean, hard, durable, and sound fragments free from organic matter or other detrimental substances.
 - 1. Retained on No. 4 sieve.
 - 2. All Rounded Particles: Maximum 50 percent by weight.
 - b) Fine Aggregate: Clean, hard grained, and angular.
 - 1. Pass No. 4 sieve.
 - 2. Non-plastic in accordance with AASHTO T90.
 - 3. Vegetable Matter or Other Detrimental Substances: Maximum 2 percent by weight.
 - 4. Dry-Rodded Unit Weight: AASHTO T19, minimum 75 pounds per cubic foot.
 - 5. Wear: AASHTO T96, maximum 40 percent.
 - 6. Weight Loss: AASHTO T104, maximum 16 percent by weight when subjected to five cycles of sodium sulfate.
 - 7. Sand Equivalent: AASHTO T176, minimum 40.

Table 10-1 GRADATION LIMITS FOR MIX DESIGN	
Sieve Size	Percent of Total Aggregate (Dry Weight)
½ inch	100
No. 4	60-80
No. 16	28-42
No. 50	11-23
No. 200	5-9

- B. Tack Coat: AASHTO M140, grade SS-1 emulsified asphalt.

2.2 EQUIPMENT

- A. Asphalt Paver: Use self-propelled paver with screed unit.

- B. Rollers: Use rubber tire and steel drum self-propelled rollers in sufficient number to keep up with paver. Use release agent other than diesel.

2.3 MIXES

- A. Develop mix design in accordance with TAI MS-2, Marshall Method.
 - 1. Determine optimum asphalt content by test data curves.
 - 2. Use test samples containing 0.5 percent increments of asphalt content.
 - 3. Include minimum of 2 test samples above and below optimum asphalt content.
- B. Mix Design Requirements:
 - 1. Marshall Stability: Minimum 1,200 pounds.
 - 2. Flow (0.01 inch): 10 to 18.
 - 3. Air Voids: 3 to 5 percent.
 - 4. Voids in Mineral Aggregate: Minimum 14 percent.
 - 5. Index of Retained Strength: Minimum 75 percent.
 - 6. Dry Stability: Minimum 200 pounds per square inch.
- C. If material source changes, develop new mix design prior to using new materials.
- D. Mix materials at central mixing plant. Use shortest mixing time needed to uniformly coat aggregate. Do not use material improperly mixed.
- E. Adjust production at mixing plant and delivery to maintain steady paving speed.

PART 3 EXECUTION

3.1 PREPARATION

- A. Do not place asphalt concrete pavement until base course has been accepted.
- B. Locate and reference utility covers prior to paving operations.
- C. Remove dirt, sand, leaves, and other objectionable materials from prepared surfaces.
- D. Prime coat is not required, but may be used.

3.2 PREPARATION - TACK COAT

- A. Clean contact surface of materials that prevent tack coat from bonding.
- B. Apply tack coat to contact surfaces of curbs, gutters, cross gutters, existing pavement, previously placed pavement and other surfaces. Apply tack coat to all pavement joints. Apply tack coat with pressure distributor at uniform rate of 0.15 gallons per square yard.
- C. Cover surfaces of manholes, valve boxes, and other utility boxes to prevent bond with asphalt pavement. Do not tack coat these surfaces.
- D. Apply tack coat same day pavement is placed.

3.3 PLACING ASPHALT PAVEMENT

- A. Place asphalt pavement at temperature between 250 and 325 degrees F with self-propelled laydown machine. Adjust paver speed to match plant production and delivery for continuous paving operation.
- B. Pave full-width where possible. If more than one pass is required, leave straight, vertical edge adjacent to next lane to be paved. Compact each pass and apply tack coat to longitudinal edge before placing adjacent pass.
- C. Compact pavement by rolling to 96 percent of Marshall density. Do not displace or extrude pavement from position. Use hand-operated compaction equipment in areas inaccessible to self-propelled compaction equipment.
- D. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks. Do not allow rollers to pass over unprotected end of freshly placed pavement. Bevel end of pavement subjected to traffic.
- E. Where pavement is placed in more than one layer, offset joints:
 - 1. Longitudinal Joints: Offset 6 to 12 inches.
 - 2. Transverse Joints: Offset minimum 6 feet.
- F. Hand rake only when necessary around obstacles.

3.4 TOLERANCES

- A. Smoothness: Maximum variation of 1/4 inch measured longitudinally, transversely, and at construction joints with 10 foot straight edge.
 - 1. If more than one layer is placed, applies only to top layer.
 - 2. Correct depressions or humps exceeding tolerances.
- B. Compacted Thickness: Not more than 1/2 inch greater nor 3/8 inch less than thickness indicated on Drawings.
 - 1. Engineer may allow excess thickness to remain in place without payment or may require removal. If removal is required, remove and replace entire depth of asphalt concrete pavement.
 - 2. If thickness is deficient, add minimum thickness of 1 inch asphalt concrete pavement.
- C. Gradation: In accordance with Table 10-2.
- D. Asphalt Content: In accordance with Table 10-3.

3.5 TESTING

- A. Gradation and Asphalt Content: Perform tests in accordance with AASHTO T30 and T308.
 - 1. Frequency: Random samples immediately behind paver before compaction in accordance with Table 10-2.
 - 2. Acceptance: Mean of deviation for each sieve size and asphalt content meets tolerances indicated in Table 10-3 and 10-4 for each lot.
 - 3. If tests indicate materials exceeds tolerances, remove and replace asphalt concrete pavement.

Table 10-2 GRADATION & ASPHALT CONTENT SAMPLING	
Lot (tons)	Minimum No. of Samples
Greater than 2,500	4
1,500 to 2,500	3
Less than 1,500	2

Table 10-3 TOLERANCE LIMITS FOR GRADATION					
Sieve Size	Mean of Deviations from Mix Design				
	1 Sample	2 Samples	3 Samples	4 Samples	5 Samples
½ Inch and Larger	0-10	0-7.3	0-6.3	0-5.6	0-5.2
No. 4	0-9	0-6.7	0-5.7	0-5.2	0-4.8
No. 16	0-7	0-5.2	0-4.6	0-4.2	0-3.9
No. 50	0-6	0-4.3	0-3.8	0-3.4	0-3.2
No. 200	0-3	0-2.4	0-2.0	0-1.8	0-1.7

Table 10-4 TOLERANCE LIMITS FOR ASPHALT CONTENT				
Mean of Deviations from Mix Design				
1 Sample	2 Samples	3 Samples	4 Samples	5 Samples
0-0.7	0-0.54	0-0.46	0-0.41	0-0.38

- B. Density: Perform with nuclear gage or take core samples.
1. Frequency: Take minimum of 1 random test for each subplot of 1,500 square yards.
 2. Acceptance: Density is 96 percent or greater for each lot. Reject subplot tests less than 96 percent.
 3. If tests are not acceptable, re-compact and retest. If necessary, remove and replace asphalt concrete pavement.

3.6 PROTECTION

- A. Protect curb and gutter, structures, and other objects from being spattered or marred by tack coat or prime coat. Do not damage curb and gutter with rollers.
- B. Immediately after placement, protect pavement from traffic until surface temperature is less than 140 degrees F. Prevent traffic from crossing vertical edge of pavement.

END OF SECTION

SECTION 11

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for formwork, reinforcing steel and accessories for cast-in-place concrete.
- B. Requirements for mixing, testing, concrete placement and curing for cast-in-place concrete.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M6 - Fine Aggregate for Portland Cement Concrete.
 - 2. AASHTO M80 - Coarse Aggregate for Portland Cement Concrete.
 - 3. AASHTO M85 - Portland Cement.
 - 4. AASHTO M154 - Air-Entraining Admixtures for Concrete.
 - 5. AASHTO M157 - Ready-Mixed Concrete.
 - 6. AASHTO M194 - Chemical Admixtures for Concrete.
 - 7. AASHTO T22 - Compressive Strength of Cylindrical Concrete Specimens.
 - 8. AASHTO T23 - Making and Curing Concrete Test Specimens in the Field.
 - 9. AASHTO T119 - Slump of Portland Cement Concrete.
 - 10. AASHTO T152 - Air Content of Freshly Mixed Concrete by the Pressure Method.
- B. American Concrete Institute (ACI):
 - 1. ACI 305R - Hot Weather Concreting.
 - 2. ACI 306R - Cold Weather Concreting.
 - 3. ACI 318 - Building Code Requirements for Reinforced Concrete.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A82- Cold Drawn Steel Wire for Concrete Reinforcement.
 - 2. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
 - 3. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

- D. Related Sections:
 - 1. Section 5 - Culinary Water.
 - 2. Section 7 - Manholes.
 - 3. Section 8 - Drainage.

1.3 SUBMITTALS

- A. Mix Design: Submit mix design and information based on batch test results to verify mix design strength at least 5 days prior to placement of concrete.
- B. Delivery Ticket: When requested by Kane County, furnish delivery ticket for each load of concrete delivered to site with information as follows:
 - 1. Name of batch plant.
 - 2. Name of Contractor and project.
 - 3. Class of concrete and type of cement.
 - 4. Time and date of batching.
 - 5. Cubic yards of concrete.
 - 6. Weights of cement and each size of aggregate.
 - 7. Amount of water added at plant.
 - 8. Amount of any additional water added.
 - 9. Amount of admixtures.
- C. Test Results: Submit one copy of air, slump, and strength test results.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 318.
- B. Procure cement and aggregate from same source for all work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store cement protected from moisture.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Conform to ACI 305R when concreting during hot weather.
- B. Conform to ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: AASHTO M85, Type II or V, low alkali, Portland type.
- B. Coarse Aggregate:
1. AASHTO M80 as modified herein.
 2. Use gradation per Table 11-1.
 3. Do not allow material passing No. 200 sieve to exceed 1.75 percent by weight of combined coarse and fine aggregate.
 4. Do not exceed percentages of deleterious substances per Table 11-2.

TABLE 11-1 Gradation - Coarse Aggregate								
Course Aggregate	Percentage Passing (by weight)							
Size	2 ½"	2"	1 ½"	1"	¾"	½"	⅜"	No. 4
2" to No. 4	100	95-100		35-70		10-30		0-5
1 ½" to No. 4		100	95-100		35-70		10-30	0-5
1" to No. 4			100	95-100		25-60		0-10
¾" to No. 4				100	90-100		20-55	0-10

TABLE 11-2 Deleterious Substances - Coarse Aggregate	
Substance	Percent (by weight)
Soft fragments	2.0
Coal and lignite	0.3
Clay lumps	0.3
Other deleterious substances	2.0

- C. Fine Aggregate:
1. AASHTO M6 as modified herein.
 2. Use gradation per Table 11-3.
 3. Do not allow material passing No. 200 sieve to exceed 1.75 percent by weight of combined coarse and fine aggregate.
 4. Do not exceed percentages of deleterious substances per Table 11-4.

TABLE 11-3 Gradation - Fine Aggregate	
Sieve Size	Percent Passing (by weight)
3/8"	100
No. 4	95-100
No. 16	45-80
No. 50	10-30
No. 100	2-10

Table 11-4 Deleterious Substances - Fine Aggregate	
Substances	Percent (by weight)
Clay lumps	0.5
Coal and lignite	0.3
Other Deleterious Substances	2.0

D. Water: Potable.

2.2 ADMIXTURES

- A. Air Entrainment: AASHTO M154 including Section 5.
- B. Water Reducers: AASHTO M194, Type A and Type D. Obtain approval prior to use.
- C. Fly Ash: Shall be used, according to mix design.
- D. Calcium Chloride: Do not use.

2.3 ACCESSORIES

- A. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
- B. Curing Compound: ASTM C309, contain pigment or dyes.

2.4 FORM MATERIALS

- A. Forms: Be suitable material, type, size, shape, quality, and strength to ensure construction as designed. Earth forms are not permitted.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture.

2.5 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars; unfinished or epoxy coated. Bars shall be free of rust, scales, flakes, or other bond-reducing coatings.
- B. Stirrup Steel: ASTM A82, unfinished.
- C. Tie Wire: Minimum 16 gage annealed type.
- D. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

2.6 CONCRETE MIX

- A. Determine mix design with required proportions of cement, aggregate, admixtures, and water.
- B. Provide concrete per Table 11-5:

TABLE 11-5 Concrete Class and Requirements							
CLASS	Coarse Aggregate Size (inches)	Maximum Water/ Cement (Gal/Sack)	Minimum Cement Content (Sacks/ C. Y.)	Slump (inches)	Air Content (Percent)	Mix Design Compress Strength (PSI)	28 Day Minimum Compress Strength (PSI)
AA(AE)	2" to No. 4	5.0	6.0	1-3.5	5.0-7.5	5210	4000
	1 ½" to No. 4	5.0	6.0	1-3.5	5.0-7.5	5210	4000
	1" to No. 4	5.0	6.5	1-3.5	5.0-7.5	5210	4000
	¾" to No. 4	5.0	6.5	1-3.5	5.0-7.5	5210	4000
A or A(AE)	1 ½" to No. 4	6.0	5.0	1-3.5	4.5-7.5	3910	3000
	1" to No. 4	6.0	5.0	1-3.5	4.5-7.5	3910	3000
	¾" to No. 4	5.5	5.25	1-3.5	4.5-7.5	3910	3000
B or B(AE)		7.0	4.0	2-5	3.0-6.0	3260	2500
C or C(AE)		8.0	4.0	2-5	3.0-6.0	2610	2000

(AE) = Air-Entrainment

- C. Maximum size of coarse aggregate:
1. Not larger than 1/5 of narrowest dimension between sides of forms.
 2. Not larger than 1/3 depth of slabs.
 3. Not larger than 3/4 of minimum clear distance between reinforcing bars or between bars and forms, whichever is least.

- D. Mix and deliver concrete in accordance with AASHTO M157.

PART 3 EXECUTION

3.1 ERECTION OF FORMWORK

- A. Verify lines, levels and centers before proceeding with formwork.

- B. Erect, brace and tie forms. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Align joints and make watertight. Keep form joints to minimum.
- D. Provide formed openings where required. Provide temporary openings in formwork where required to facilitate cleaning and inspection.
- E. Apply form release agent on formwork in accordance with manufacturer's recommendations. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

3.2 PLACEMENT OF REINFORCEMENT AND EMBEDDED PARTS

- A. Verify requirements for concrete cover over reinforcement.
- B. Accurately place anchors, seats, plates, reinforcement and other items to be cast into concrete. Securely positioned to not allow movement or displacement.

3.3 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- B. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.
- C. Keep concrete subgrade firm and free from water. If concrete subgrade is dry, dampen with water prior to placing concrete.
- D. Keep materials concrete is to come in contact with free from frost.

3.4 PLACING CONCRETE

- A. Place concrete in accordance with ACI 318.
- B. Notify Kane County minimum 24 hours prior to placing concrete.
- C. Ensure reinforcement, inserts and embedded parts are not disturbed during concrete placement.

- D. Place concrete continuously between predetermined expansion, control, and construction joints.
- E. Do not interrupt successive placement; do not permit cold joints to occur.
- F. After concrete has been conveyed from mixer, do not add water. Adding water to placed concrete will be cause for rejection.

3.5 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Spray exposed concrete surfaces with concrete curing compound after free water has disappeared. Apply at rate recommended by manufacturer.

3.6 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surface scheduled for exposure to view.
- C. Clean forms to remove foreign matter. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

3.7 TESTING

- A. Take minimum of 1 random test for each 50 cubic yards or fraction thereof placed per day:
 - 1. Slump Test: AASHTO T119.
 - 2. Air Test: AASHTO T152.
 - 3. Strength Test: AASHTO T22 and T23, cast 4 cylinders for each test. Test one cylinder at 7 days, and test 3 cylinders after 28 days. Strength will be average of 3 cylinders.
- B. Tests shall meet requirements of Table 11-5.

- C. If slump test does not meet specification, repeat test on same load. Concrete will be accepted if second test meets specification. Concrete will be rejected and removed from site if second test does not meet specification.
- D. If air test does not meet specification, repeat test on same load. Concrete will be accepted if second test meets specification. Concrete will be rejected and removed from site if second test does not meet specification.
- E. If strength test does not meet specification, Kane County may reject concrete and require removal.

3.8 PATCHING

- A. Allow inspection of concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Kane County upon discovery. Patch imperfections.

3.9 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replace defective concrete.

END OF SECTION

SECTION 12
FLOWABLE FILL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Flowable fill for bedding in utility trenches.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials: (AASHTO):
1. AASHTO M85 - Portland Cement.
 2. AASHTO T27 - Sieve Analysis of Fine and Coarse Aggregates.
- B. American Society for Testing and Materials (ASTM):
1. ASTM C618 - Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
- C. Related Sections:
1. Section 4 - Trenching.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Cement: AASHTO M85, Portland Cement, Type I or II.
- B. Fly Ash: ASTM C618, Class F, except maximum 3 percent loss on ignition.
- C. Fine Aggregate:
1. Use natural sand.
 2. Gradation: AASHTO T27, in accordance with Table 12-1.

Table 12-1 FINE AGGREGATE GRADATION	
Sieve Size	Percent Passing
No. 3/4	100
No. 100	0-10

2.2 MIXES

- A. Mix Design:
 - 1. 28 Day Compressive Strength: 50 to 150 psi.
 - 2. Portland Cement: Minimum 50 pounds per cubic yard.
 - 3. Fly Ash: Minimum 300 pounds per cubic yard.
 - 4. Slump: 6-10 inches.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Use flowable fill for backfill in utility trenches when trench is within existing roadway.
- B. Place flowable fill minimum of 8 inches on each side of utility.

3.2 PROTECTION

- A. Do not damage or displace utility during placement of flowable fill.
- B. Do not permit vehicular traffic for minimum of 24 hours after placement.
- C. Steel safety plates may be used to allow traffic across trench same day as flowable fill placement. Securely anchor plates to prevent movement.

END OF SECTION

SECTION 13

CONCRETE CURB, GUTTER, AND FLATWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for concrete curb and gutter, cross gutter, sidewalk, curb ramp, and driveway.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M213 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- B. Related Sections:
 - 1. Section 3 - Earthwork.
 - 2. Section 9 - Untreated Base Course.
 - 3. Section 11 - Cast-in-Place Concrete.

1.3 DEFINITIONS

- A. Concrete Flatwork: Includes sidewalks, driveways, and curb ramps.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F, base has free surface water, or base is saturated.

1.5 SITE PREPARATION REQUIREMENTS

- A. All concrete drainage elements must be in place prior to roadway finishing/paving operations to ensure proper drainage functions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Concrete: Class AA(AE) in accordance with Section 11.

- B. Curing Compound: In accordance with Section 11.
- C. Reinforcing Steel: In accordance with Section 11.
- D. Expansion Joint Filler: AASHTO M213, preformed joint filler.
- E. Base:
 - 1. Curb and Gutter and Cross Gutter: Untreated base course in accordance with Section 9.
 - 2. Concrete Flatwork: Pea gravel with 3/8 inch maximum gradation or untreated base course in accordance with Section 9.

PART 3 EXECUTION

3.1 PREPARATION

- A. Prepare subgrade in accordance with Section 3.
- B. Place and compact base material. For untreated base course, compact in accordance with Section 9. For pea gravel, proof roll with compaction equipment.
- C. Verify gradients and elevations of base are correct.

3.2 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.
- D. Slip form curb and gutter machine will be accepted.
- E. Place reinforcing steel at required locations.

3.3 PLACING CONCRETE

- A. Notify Kane County minimum 24 hours prior to placing concrete.
- B. Moisten base to minimize absorption of water from fresh concrete.

- C. Place concrete continuously between predetermined construction joints in accordance with Section 11.
- D. Slope concrete uniformly to drain without bird baths.
- E. Spray exposed concrete with curing compound in accordance with Section 11.

3.4 JOINTS

- A. Curb and Gutter and Cross Gutter:
 - 1. Control Joints: Score or saw cut at 10 feet on center.
 - 2. Expansion Joints: Place premolded joint filler at 50 feet on center and at beginning and ending of curb returns at intersections. When concrete is placed with slip form curb and gutter machine, place at beginning and end of each continuous run.
- B. Flatwork:
 - 1. Control Joints: Score or saw cut at 5 feet on center.
 - 2. Expansion Joints: Place premolded joint filler at 50 feet on center and at beginning and ending of curb returns at intersections.
- C. When curb and gutter and sidewalk are back to back, align joints.

3.5 FINISHING

- A. Round edges.
- B. Remove marks or irregularities from finish surface.
- C. Provide light broom finish.
 - 1. Flatwork: Finish transverse to traffic.
 - 2. Curb and Gutter and Cross Gutter: Finish parallel to flow line.

3.6 BACKFILLING

- A. After concrete has cured sufficiently to prevent damage, place and compact backfill.

3.7 TOLERANCES

- A. Maximum Variation of Surface Smoothness: 1/4 inch in 10 feet.

3.8 TESTING

- A. Subgrade: In accordance with Section 3.
- B. Untreated Base Course: In accordance with Section 9.
- C. Concrete: In accordance with Section 11.

3.9 PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, mechanical injury and defacing.
- B. Do not permit vehicular traffic over or operate compaction equipment near concrete for at least 7 days after placement.

END OF SECTION

SECTION 14

STREET MONUMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for street monuments.

1.2 REFERENCES

- A. Related Sections:
 - 1. Section 11 - Cast-in-Place Concrete.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Concrete: Class AA (AE) in accordance with Section 11.
- B. Monument Post: Bass, D&L Supply Model K-9085 or approved equal.
- C. Monument Cover and Frame: Cast iron, D&L Supply Model K-6313 or approved equal.
- D. Rock: 1 inch maximum size material.

PART 3 EXECUTION

3.1 PREPARATION

- A. Measure location of street monument from reference points.
- B. Construct street monument after pavement has been placed to finish grade.

3.2 CONSTRUCTION

- A. Remove asphalt concrete pavement to 24 inches diameter around street monument location.
- B. Excavate as necessary to install street monument.
- C. Install monument post in concrete and mark location of point.
- D. Backfill with rock as needed. Set monument cover and frame centered over monument post and flush with pavement surface.
- E. Place and consolidate concrete. Match pavement surface and monument elevation.

3.3 TOLERANCES

- A. Cover Elevation: Plus or minus 1/8 inch of finish grade.

3.4 PROTECTION

- A. Protect concrete from damage until sufficient strength is obtained to support traffic loads.

END OF SECTION

SECTION 15

STREET AND TRAFFIC SIGNS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for street and traffic signs, see also standard drawing #RD18.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A570 - Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
 - 2. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.3 DEFINITIONS

- A. Substrate: Base material upon which background sheeting is attached. Substrate is aluminum as indicated.
- B. Sheeting: Material comprising background, legend, border, and symbols. Sheeting is reflective.
- C. Panel: Assembly consisting of substrate and attached sheeting. Several panels may be necessary to complete one sign.
 - 1. Type A-1 - Reflective legend, symbols, and borders.
- D. Sign: Complete assembly comprised of post, frame, and panel.

PART 2 PRODUCTS

2.1 SIGN POST

- A. Steel Post: ASTM A570, Grade 50, 2 inch by 2 inch square tube, 14 gauge, with pre-cut holes.
 - 1. Finish: ASTM A653, G90, galvanized followed by conversion coating and clear organic polymer top coat.
- B. Anchor Post: One size larger than sign post, 12 gauge, 30 inch minimum length.

2.2 SUBSTATE

- A. Aluminum: 0.08 inch thick in accordance with ASTM B209 Alloy 5052-H38.

2.3 SHEETING

- A. Reflective Sheeting: Encapsulated lens, high intensity prismatic, reflective sheeting in accordance with Standard Specifications for Construction of Road and Bridges on Federal Highway Projects FP-85, Type III A.

2.4 ACCESSORIES

- A. Fasteners:
 - 1. Panel to Post: Drive rivet with washer.
 - 2. Post to Anchor: Cad-plated corner bolt.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Securely fasten panel to post.
- B. Drive anchor post into ground. Attach sign post to anchor post. Install in accordance with manufacturer's recommendations.
- C. Install sign at proper elevation and orientation.

3.2 PROTECTION

- A. Protect sign from damage. If damaged, replace sign.

END OF SECTION

SECTION 16

ELECTRICAL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for construction of power systems.
- B. Requirements for streetlights and yard lights.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO T90 - Determining the Plastic Limit and Plasticity Index of Soils.
- B. National Electric Code (NEC) and N.E.S.C.
- C. Related Sections:
 - 1. Section 4 - Trenching.
 - 2. Section 11 - Cast-in-Place Concrete.
- D. Underwriters Laboratories, Inc. (UL).

1.3 ELECTRICAL SERVICE REQUIREMENTS

- A. Electric Service Agreement: An electrical service agreement with the appropriate electrical energy provider shall be executed at such time as service infrastructure is to be constructed if electrical service is to be part of the project. Special requirements may need to be met.

1.4 CUSTOMER SERVICE FACILITIES REQUIREMENTS

- A. Meters are to be located on front of structure or front 1/3 of side of structure. Meter must be visible from street or driveway, and not enclosed in any way. Location to be approved by utility service provider and installed to providers standards.
- B. Meters will not be permitted in areas as follows:
 - 1. Locations not readily accessible.
 - 2. Locations hazardous to personnel.

- 3. Surfaces subject to excessive vibration.
 - 4. Elevated or depressed areas not having access by ramp or clear stairway of normal tread and use conforming to building code requirements.
 - 5. Substation areas or transformer vaults.
 - 6. Common areas with dog.
- C. Provide approved meter socket having proper terminal arrangement and capacity to adequately handle service requirements.
 - D. Extend building wiring from meter socket terminals to service attachment at weatherhead.
 - E. Provide adequate and substantial means for electrical provider to attach appropriate service line equipment to building.
 - F. Provide ample space around meter attachment to permit unobstructed area for meter installation and maintenance.
 - G. Provide adequate and proper protective equipment to protect against over load, over or under voltage or phase failure.
 - H. Provide switch or other approved disconnecting device. Install disconnecting device on load side of meter to control energy registered by meter.
 - I. Trenching for the installation of underground secondary wire, conduit and backfilling after conduit installation, will be determined by the electrical service provider.
 - J. New services are to be inspected and approved by county Inspector before service will be energized.

1.5 UNDERGROUND RESIDENTIAL DISTRIBUTION CABLE REQUIREMENTS

- A. Size of cable for residential distribution systems shall be in accordance with Energy Providers policy and/or design.

1.6 STREETLIGHT REQUIREMENTS

- A. Streetlights will be evaluated on a project specific basis, and as the development agreement dictates.
- B. Streetlights shall be night sky compliant.

1.7 REGULATORY REQUIREMENTS

- A. All materials, equipment, and workmanship shall conform to requirements of current edition of National Electrical Code and N.E.S.C.
- B. Products: Listed and classified by Underwriters Laboratories, Inc.
- C. All electrical work shall be performed by a licensed electrical contractor and/or qualified personnel.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Conductor: Size and type as specified by service provider.
- B. Junction Boxes: Approved boxes for electrical use with no equipment, except cable, splices, and elbows. Junction boxes shall be specified by service provider.
- C. Transformer and Equipment Pads: Concrete or other weather proof material according to manufacturers recommendations as approved by service provider.
- D. Concrete: In accordance with Section 11.
- E. Sand Bedding: Well graded granular material with rounded to sub-rounded particles.
 - 1. Gradation: In accordance with Table 16-3.
 - 2. No open-graded material such as pea gravel.
 - 3. Non-plastic in accordance with AASHTO T90.
- F. Conduit: Size as indicated, but not less than 2 inch. Electrical service provider may use smaller conduits on a project specific basis.
 - 1. Gray Schedule 40 Polyvinyl Chloride (PVC) Conduit: Allowed for use only underground or below concrete with galvanized rigid steel or IMC elbows and risers. Provide PVC wrap as necessary.
 - 2. Galvanized rigid steel or galvanized intermediate metal conduit (IMC) is allowed for use in all areas, with PVC wrap for buried installations.
 - 3. Schedule 80 PVC is allowed for above grade installations. Comply with local service provider, NEC, and NESC codes.

- G. Conduit Fittings:
1. Rigid Steel Conduit & IMC: Threaded and designed for conduit use.
 2. PVC Conduit:
 - a) PVC type. Use PVC adaptors at all boxes.
 - b) PVC components, (conduit, fittings, cement) shall be compatible.

Table 16-3 Gradation for Sand Bedding	
Sieve Size	Percent of Total Aggregate (Dry Weight)
3/8 inch	100
No. 200	0-20

PART 3 EXECUTION

3.1 PREPARATION

- A. Property or lot lines staked and final grades at equipment locations established before beginning to trench.

3.2 CONSTRUCTION

- A. Trenching shall be in accordance with Section 4.
- B. Use sand bedding above and below conduit. Place sand bedding minimum depth of 4 inches below and 8 inches above cable or conduit. Place and compact sand bedding in two lifts.
- C. Install wiring with correct standards and tagging.

3.3 ELECTRICAL CONNECTION

- A. Only authorized employees of the Service Provider will be permitted to connect or disconnect electrical service to or from electric lines.
- B. Service provider seal all meters and enclosures for meters, metering equipment and service entrance equipment on line side of meter. Do not break seal. Do not tamper or interfere in any way with meter or connections.

3.4 INSPECTION

- A. No work shall be embedded in concrete, backfilled, or otherwise covered or concealed until inspected by service provider and/or local Building Inspector, as necessary by code and Service Provider's policy.

END OF SECTION

SECTION 17

CHIP SEAL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Paving asphalt and cover aggregate evenly spread as a uniform, skid-resistant roadway surface treatment.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO T 11: Materials Finer Than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing
 - 2. AASHTO T 19: Unit Weight and Voids in Aggregate
 - 3. AASHTO T 27: Sieve Analysis of Fine and Coarse Aggregates
 - 4. AASHTO T 59: Standard Test Methods for Emulsified Asphalts
 - 5. AASHTO T 96: Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
 - 6. AASHTO T 104: Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
 - 7. AASHTO T 278: Surface Frictional Properties Using the British Pendulum Tester
 - 8. AASHTO T 279: Accelerated Polishing of Aggregates Using the British Wheel
 - 9. AASHTO TP 61: Determining the Percentage of Fractured Particles in

Coarse Aggregate

- B. American Society of Testing and Materials (ATSM):
1. ASTM C 88: Standard Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate.
 2. ASTM C 117: Standard Method of Test for Amount of Material Finer Than 0.075 mm Sieve in Aggregate.
 3. ASTM C 131: Standard Test Method for Resistance to Degradation of Small-Size coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 4. ASTM C 136: Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 5. ASTM C 142: Standard Test Method for Clay Lumps and Friable Particles in Aggregates.
 6. ASTM D 2170: Standard Test Method for Kinematic Viscosity of Asphalts (Bitumens).
 7. ASTM D 3319: Standard Test Method for Accelerated Polishing of Aggregates Using the British Wheel.
 8. ASTM D 3628: Standard Practice for Selection and Use of Emulsified Asphalts.
 9. ASTM D 4791: Standard Test Method for Flat or Elongated Particles in Coarse Aggregate.
 10. ASTM D 5821: Standard Test Method for Determining the percentage of Fractured Particles in Coarse Aggregate.

1.3 SUBMITTALS

- A. Mix Design: 10-days prior to use, submit.
 - 1. Type and grade of paving asphalt to be used (if not specified).
 - 2. Aggregate gradation test results.
 - 3. Results of asphalt/aggregate compatibility test.
 - 4. List of asphalt additives.
- B. Equipment: Submit list of equipment to be used.
- C. Bill of Lading: Prior to placing emulsified asphalt submit bill of lading showing:
 - 1. Weight of emulsified asphalt supplied by vendor.
 - 2. Weight of emulsified asphalt after water has been added as required for application purposes.
- D. Quality Control Report: Upon ENGINEER's request, submit a written quality control inspections and testing report describing source and field quality control activities performed by CONTRACTOR's suppliers and CONTRACTOR.

1.4 QUALITY ASSURANCE

- A. Determine paving asphalt weights by mix design.
- B. Do not change source of supply of paving asphalt or aggregate without supporting changes in mix design data.
- C. Reject coating products that do not meet requirements of this Section.

- D. Remove any product found defective after installation and install acceptable product at no additional cost to the OWNER.

1.5 WEATHER

- A. Lay seal coat if air and roadbed temperatures in the shade is greater than 70 deg. F. and rising. Allow four weeks of warm weather cure time. This generally limits performance of work from May 15 to August 31.
- B. Do not lay seal coat if pavement surface is above 120 deg. F.
- C. Do not pave during rain or unsuitable weather.

1.6 ACCEPTANCE

- A. General: Opening to traffic does not constitute acceptance.
- B. Chip Seal Material: Random samples will be collected.
 - 1. Paving Asphalt.
 - 2. Aggregate (sampled from the hauling equipment): Accepted if the following conditions are met. If any condition is not met, a 10-percent price reduction will be assessed against the lot. Lot size is one day's production with 500 tons sub-lots.
 - a. the average gradation of each sieve for the lot is within the target gradation band for that sieve; and

- b. the number of individual aggregate samples in each subplot outside the target gradation band does not exceed 2; and
 - c. no aggregate sample is outside the target gradation band by more than 2-percent on any one sieve; and
 - d. no tolerance will be allowed for the minus 200-portion of cover material.
- C. Chip Seal Placement: Acceptance is on a block-by-block basis. A 5-percent price reduction (10-percent maximum) will be assessed against the block for each condition not met.
 - 1. Paving Asphalt Application: Uniform and no ridging.
 - 2. Aggregate Spreading:
 - a. Embedment: After rolling and evaporation, random sampling reveals large particles are embedded in the paving asphalt on their flat side to a depth of 50% to 70%.
 - b. Asphalt See-Through: No more than 15% black (asphalt) can be seen through the newly laid and compacted rock chip after sweeping.

PART 2 PRODUCTS

2.1 PAVING ASPHALT

- A. Cationic emulsion.

1. CRS-2A
 2. CRS-2B
 3. MC-3000
- B. Use any of the following additives to match aggregate particle charge, weather conditions and mix design.
1. Anti-strip: To change or neutralize particle charges.
 2. Enhancer: To promote greater film thickness on the aggregate.
 3. High Float Agent: To improve temperature susceptibility of the asphalt and impart a gel structure to the asphalt.
 4. Polymer: To reduce stripping, improve coating, decrease temperature susceptibility and increase stability of mix.
 5. Rejuvenator: To adjust the penetration of the base asphalt or soften reclaimed asphalt.

2.2 COVER AGGREGATE

- B. Use crusher processed virgin aggregate consisting of natural stone, gravel, or slag meeting the requirements of Table 1.

Table 1 - Chip Seal Cove Material Properties		
Unit Weight, see Note 1	AASHTO T 19	100 lb/ft ³ , max
One Fractured Face	AASHTO TP 61	95% min
Two Fractured Faces	AASHTO TP 61	90% min
LA Wear, see Note 1	AASHTO T 96	30% max
Soundness	AASHTO T 104	10% max
Flakiness Index	Materials MOI 8-933	17 max
Stripping, see Note 1	Materials MOI 8-945	10% max
Polishing, see Note 1 Performed on aggregate prior to crushing	AASHTO T 278, T 279	31 Min
Field Coating of Emulsified Asphalt.	AASHTO T 59	Rating of "Good"
Note 1: The County has the right to waive this requirement if the aggregates have proven acceptable through successful past performance as determined by the Engineer.		

- C. Grade with the following limits to meet the specified test standard in AASHTO T 27 and T 11.

Table 2 - Chip Grading			
	Percent Passing		
Size	3/4" Chip	1/2" Chip	3/8" Chip
3/4"	100	--	--
1/2"	70-90	100	--
3/8"	60-80	70-90	90-100
No. 4	0-10	0-10	5-10
No. 8	0-5	0-5	0-4
No. 200	0-1	0-1	0-1

2.3 MIX DESIGN

- A. Select type and grade of emulsified asphalt per ASTM D 3628.

- B. Determine asphalt application rate based upon achieving an aggregate embedment of 50 to 70-percent.

Note: It is difficult to get adequate embedment of 3 / 8-inch aggregate with a 0.30 asphalt application rate.

PART 3 EXECUTION

3.1 PREPARATION

- A. General:
 - 1. Wait at least 7-days before placing seal coat on newly patched surfaces.
 - 2. Locate and protect all street fixtures.
- B. Protection:
 - 1. Use reflective tabs to mark roadway striping before applying asphalt.
 - 2. Protect manholes, valve boxes, inlets and other service entrances. Install invert covers.
- C. Notification:
 - 1. Notify adjacent property owners of the day and time that the paving will take place. Notify them of potential vehicle tow away.
 - 2. Post notices one to three days in advance of paving.
 - 3. Should work not occur on the specified day, post a new notification.
- D. Trees, Plants, Ground Cover.
 - 1. Protect trees, plants and other ground cover from damage.

2. Prune trees to allow equipment passage underneath. Repair tree damage at no additional cost to OWNER.
-
- D. Traffic Control: Direct traffic through work to provide worker and public safety. Do not proceed without flaggers.
 - E. Crack Repair. Remove excess asphalt after crack filling. Allow crack seal to thoroughly dry before cleaning. Repair potholes, raveled areas, or low areas.
 - F. Cleaning: Remove vegetation from cracks, edges and joints. Remove loose material, mud spots, sand, dust, oil, vegetation, and other objectionable material from pavement surface. Water flushing will not be permitted if pavement surface is cracked.
 - H. Equipment: Run a distributor truck test strip. Show uniform application (no drilling) of bituminous material. Show triple overpass of distributor bar.
 - I. Tack Coat: Apply tack coat to high-absorbent, polished, oxidized, or raveled asphalt surfaces or to concrete or brick surfaces.

3.3 APPLICATION

- A. Lines:
 1. Mask off the end of streets and intersections to provide straight lines.
 2. Make straight lines along lip of gutter and shoulders.
 3. Keep lap lines out of wheel path.

- B. Keep viscosity between 50 and 100 centistokes per ASTM D 2170 during application.
- C. Apply cover aggregate within +1 to -2.0-pounds per square yard.
 - 1. Use a damp chip but not saturated. (Note. If you see water running out of the haul truck, the chips are too wet).
 - 2. For polymer and latex modified emulsions, apply chips immediately.
 - 3. For other emulsions, maintain a distance of not more than 100-feet between the distributor and the chip spreader.
 - 4. Spread larger particles first.
 - 5. Hand broom the cover material, if necessary to distribute the aggregate uniformly over the surface.
- D. If bleeding occurs, apply a blend of 25 to 50-percent hydrated lime with sand (blotting material). Use sand to cool chips.
- E. Expose all street fixtures after seal coat operations.

3.4 ROLLING

- A. Use a rubber tire roller to seat aggregate. Apply at least 2 complete rolling coverages.
- B. Complete rolling before the bituminous material cools or hardens.
- C. Keep traffic off at least 4-hours or until moisture leaves the remaining chips. Sweep the surface before allowing uncontrolled traffic on the chips.

3.5 FOG SEAL

- A. Apply to chips within 3 –weeks, but not less than 10 days of placing chips.
 - 1. Use CSS-1h diluted to 50/50 with water.
- B. Keep viscosity between 50 and 100 centistokes per ASTM D 2170 during application.

3.6 REPAIR

- A. Remove spatter or mar from curb, gutter and sidewalk at no additional cost to OWNER.
- B. Remove any product found defective after installation and install acceptable product at no additional cost to the OWNER.
- C. Fill any joints or cracks that are not covered by the coat. Leave no streaks, holes, bare spots, or cracks through which liquids or foreign matter could penetrate to the underlying pavement.
- D. Repair collateral damage caused by construction.

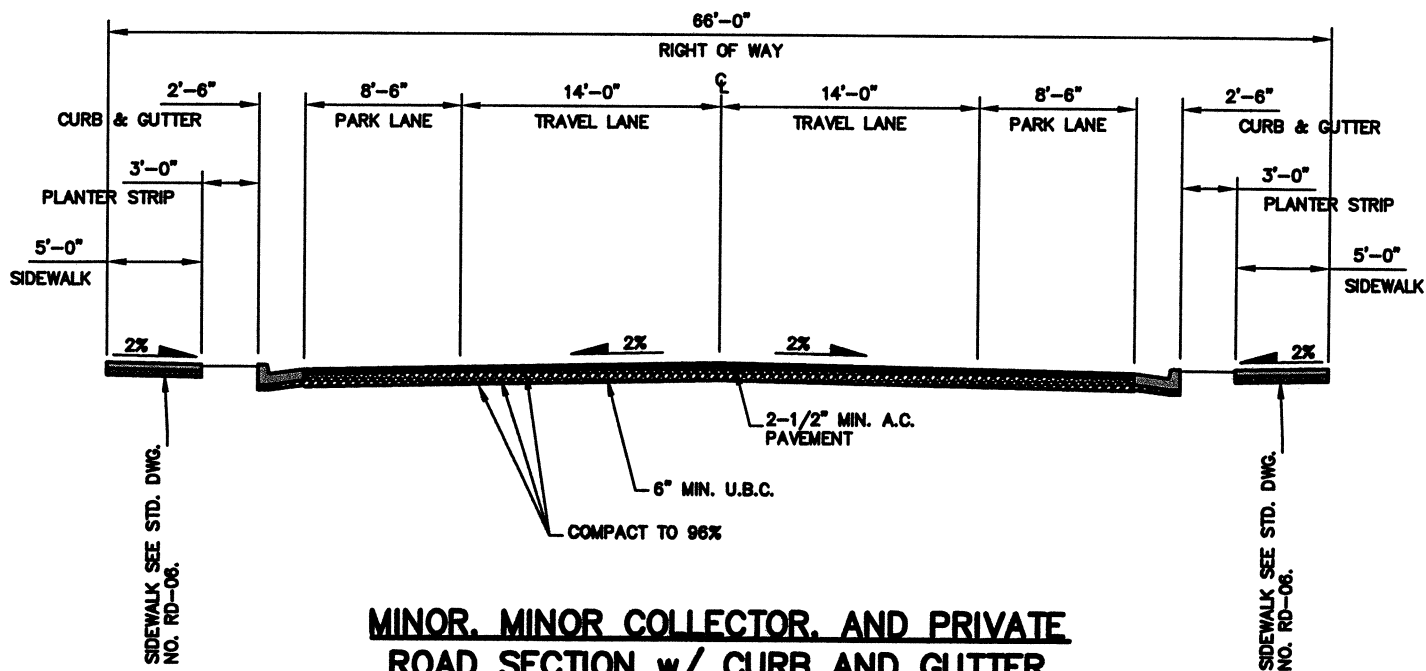
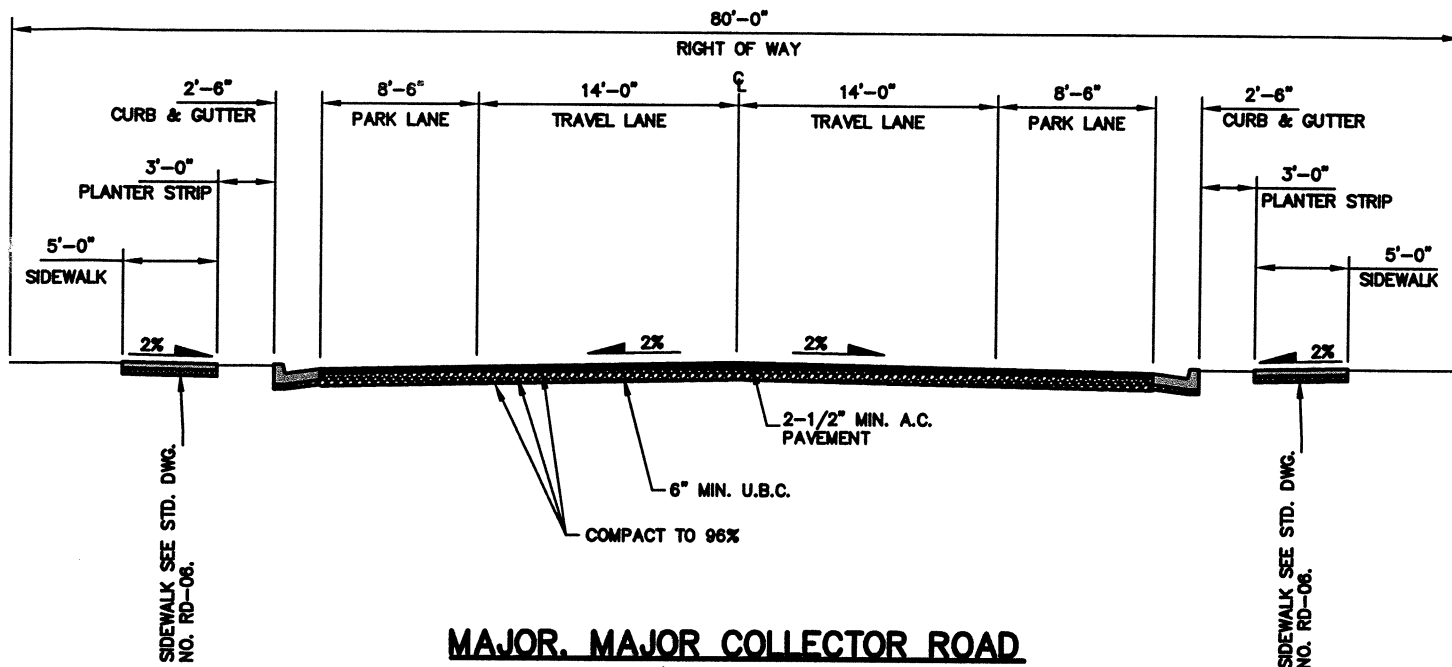
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DRAWINGS

DRAWING INDEX

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DATE: JULY 2012	FILE: KANE COUNTY	TC ENGINEERING, ^{PC} A "DESIGN-BUILD" FIRM EXCELLENCE....ON TIME! DANIEL W. THEREAU, P.E. P.O. BOX 55, KANAB, UTAH 84741 (435)644-2931 (888)644-2031 (435)686-8356	ROAD SECTIONS STANDARD DRAWINGS KANE COUNTY SCALE= NONE	REVISED:		INDEX
SHEET:	DRAWN BY:			JULY 2012		
INDEX	DVT					SHEET: 2



REVISIONS		
DATE	APP. BY	REMARKS

NOTE: ALL PAVED SURFACES SHALL BE
CHIP SEALED DURING ONE YEAR
WARRANTY PERIOD.



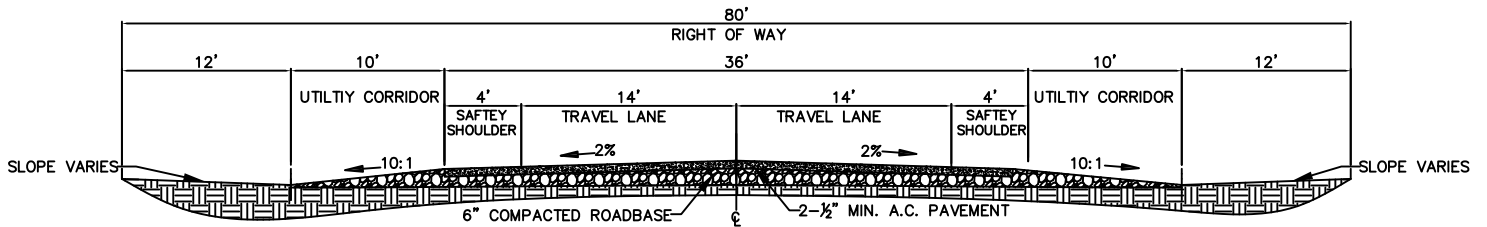
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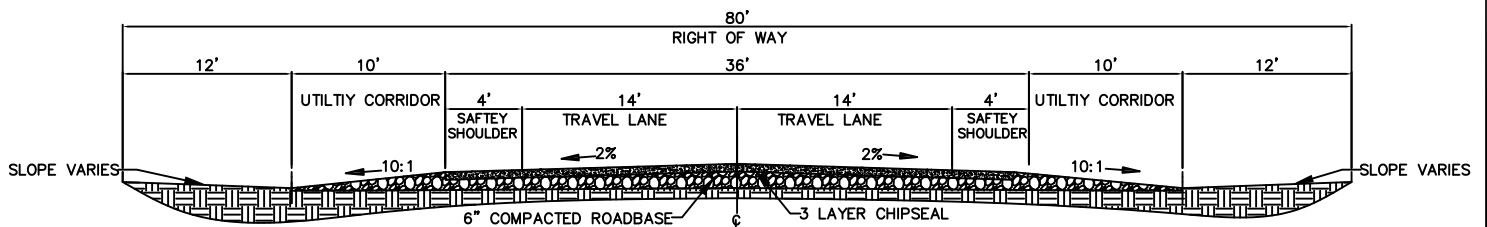


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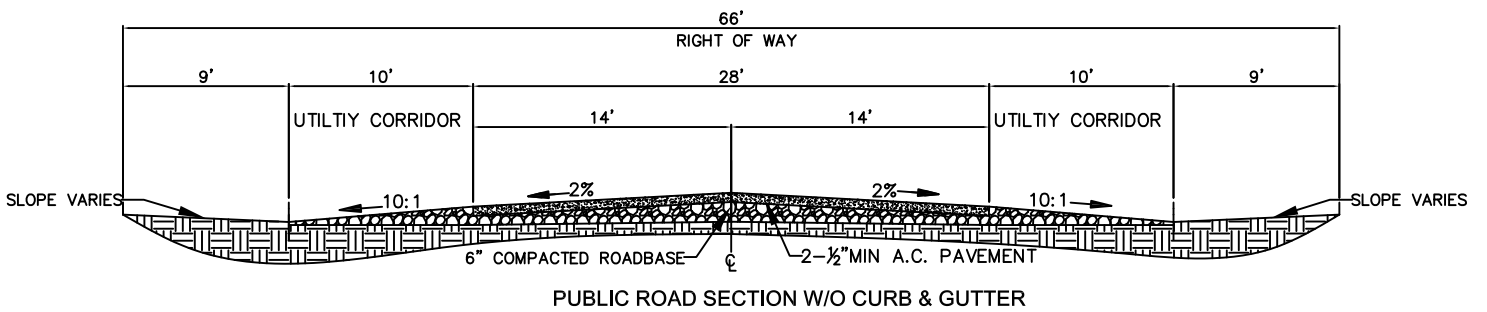
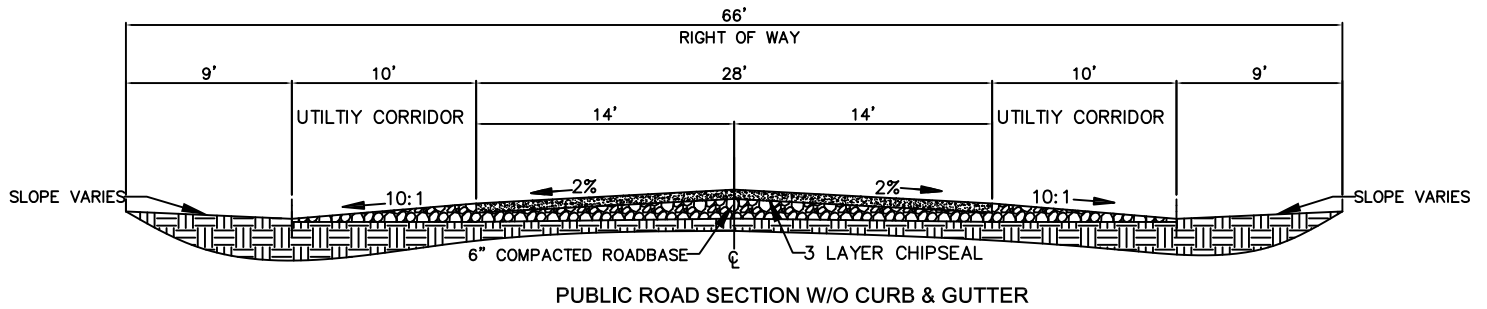


PUBLIC ROAD SECTION W/O CURB & GUTTER



PUBLIC ROAD SECTION W/O CURB & GUTTER

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						SHEET: 4



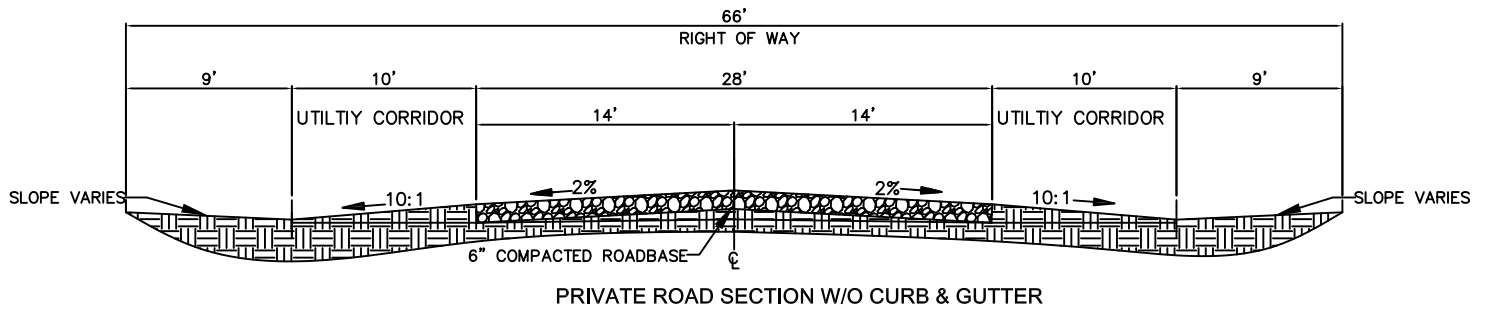
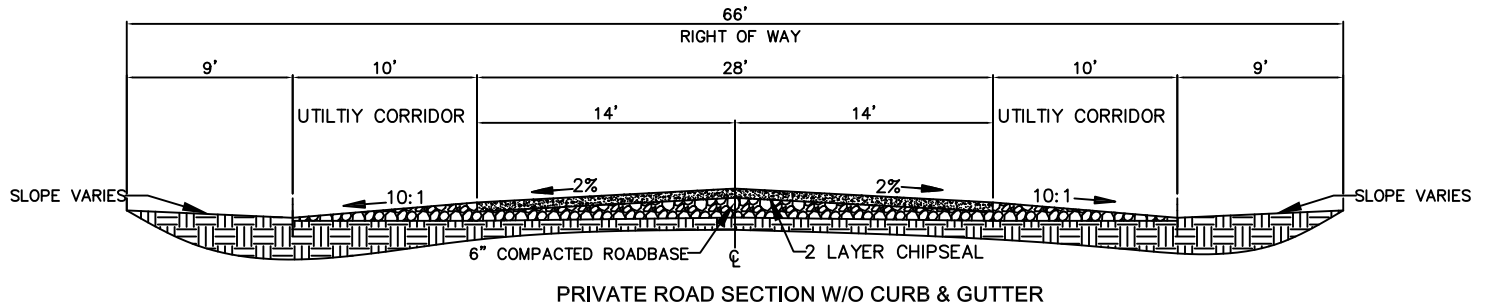
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SHEET:	DRAWN BY:
RD-02B	DVT

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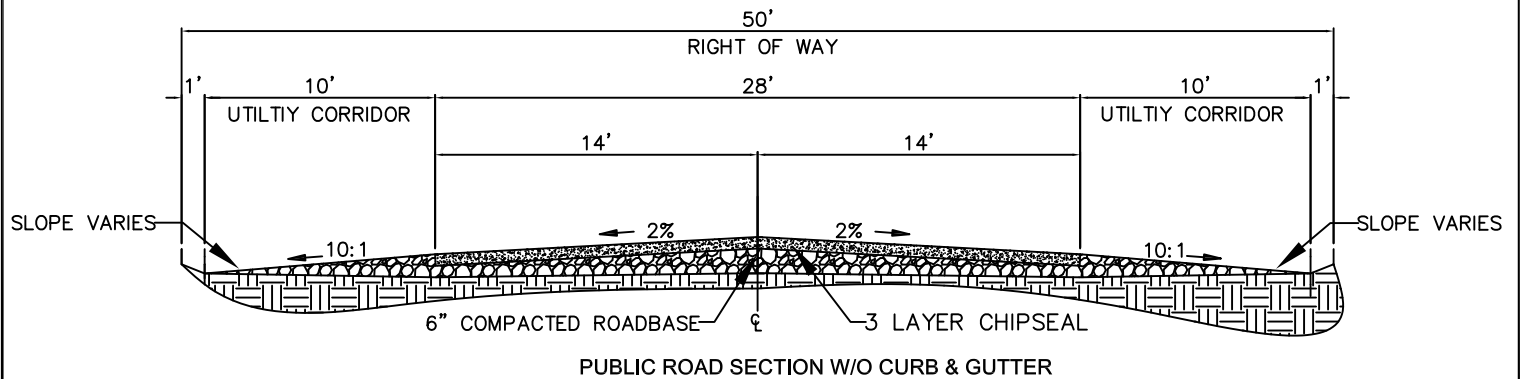
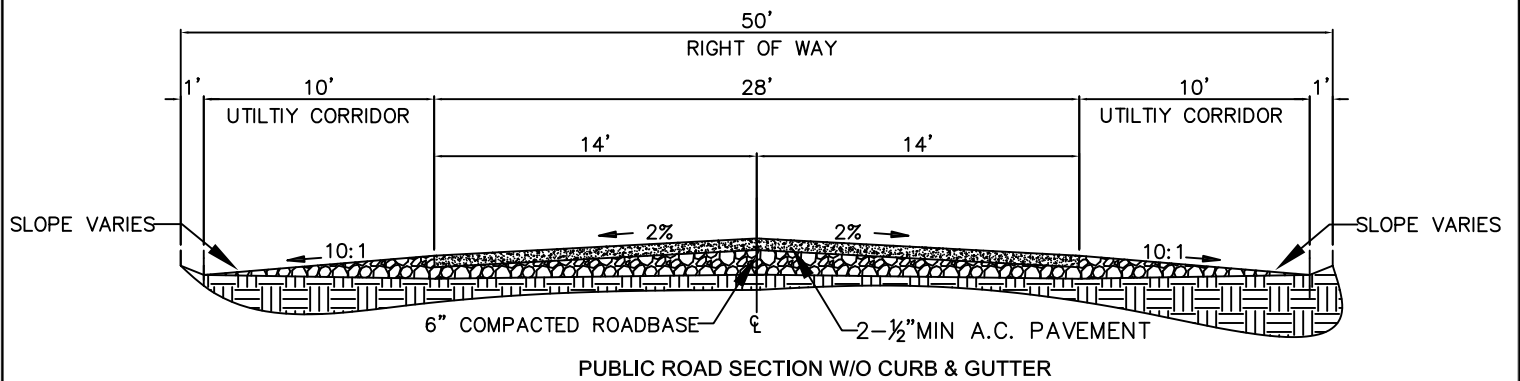
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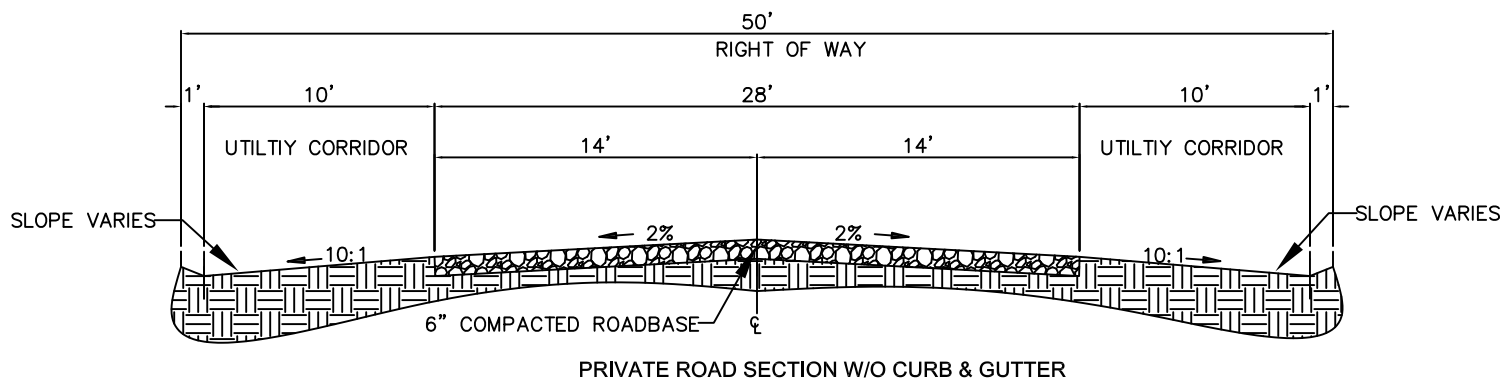
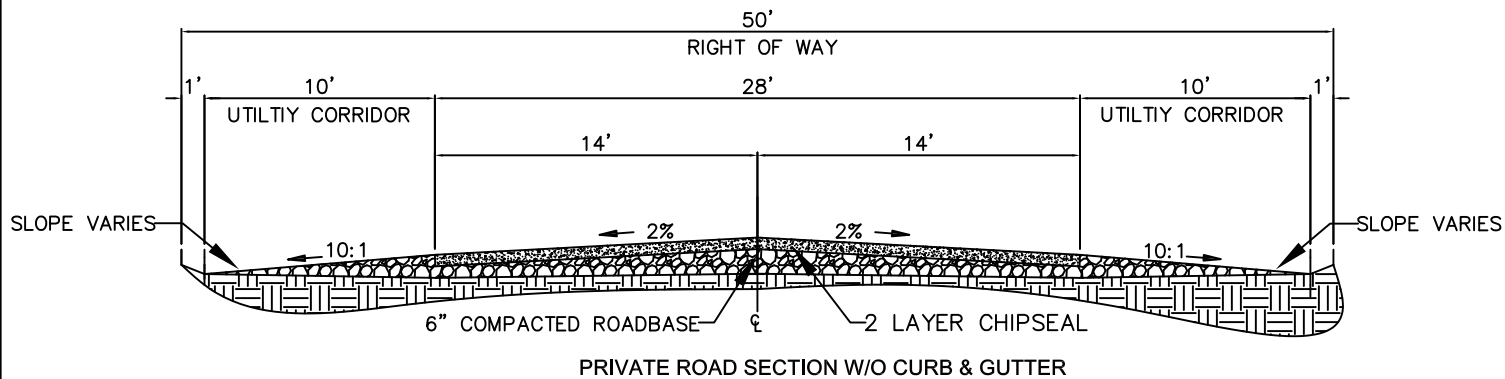
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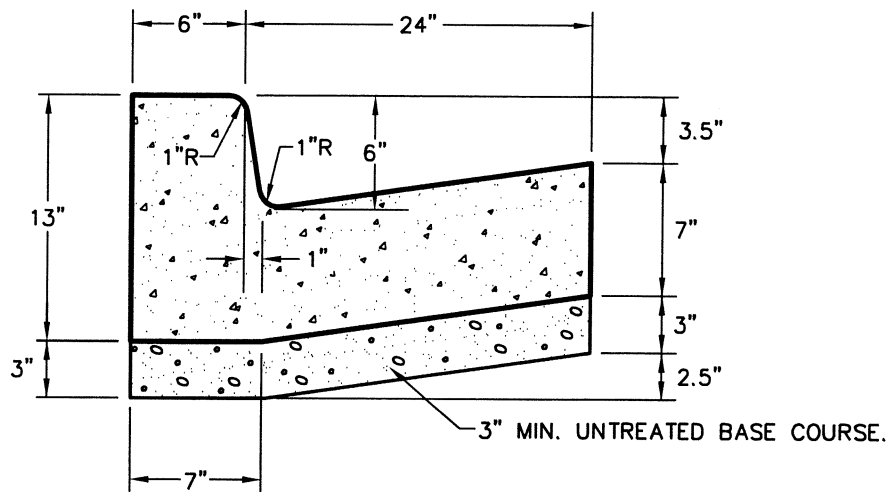
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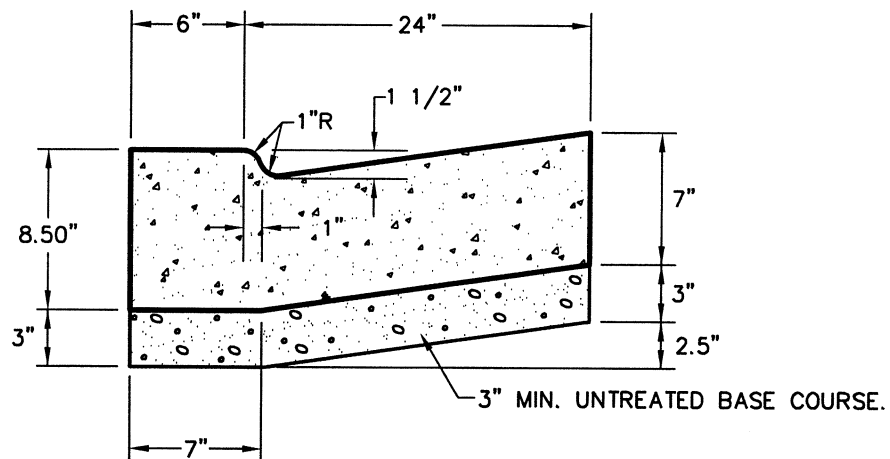
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JULY 2012		
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STANDARD CURB



DRIVE DEPRESSION CURB

TYPE B1 CURB & GUTTER

REVISIONS		
DATE	APP. BY	REMARKS

NOTE: SEE TYPICAL CONCRETE JOINTS
ON STD. DWG. NO. RD-09.



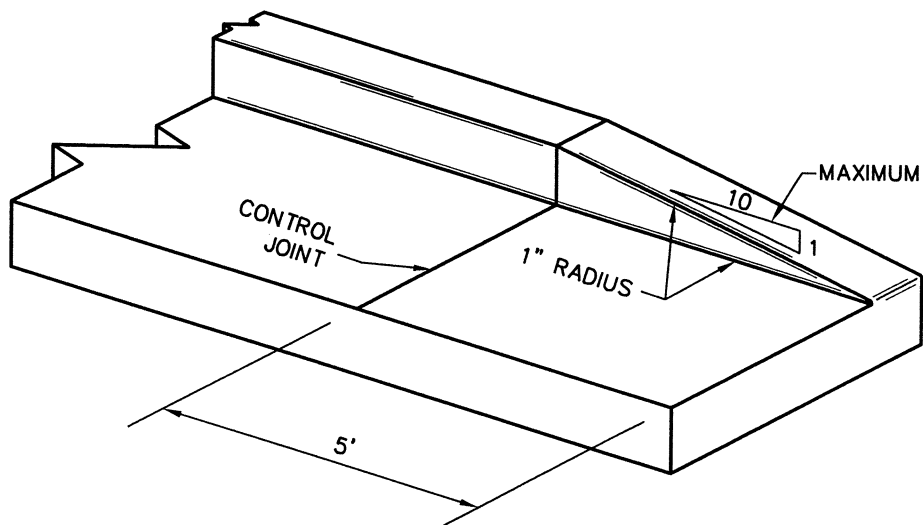
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RD-03	KANE COUNTY	RD-03
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RD-04

KANE COUNTY

RD-04

ROAD CONSTRUCTION

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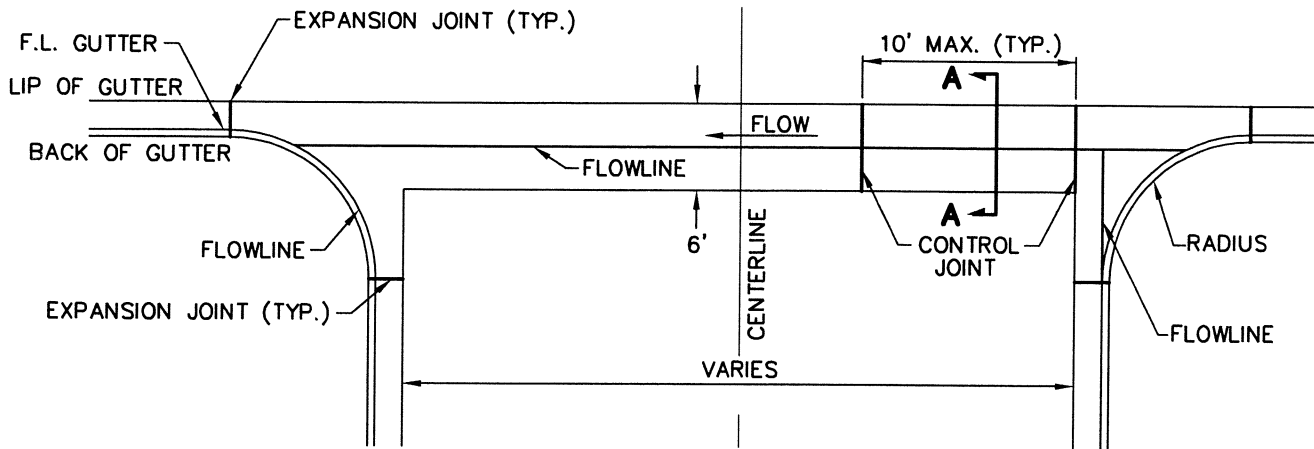
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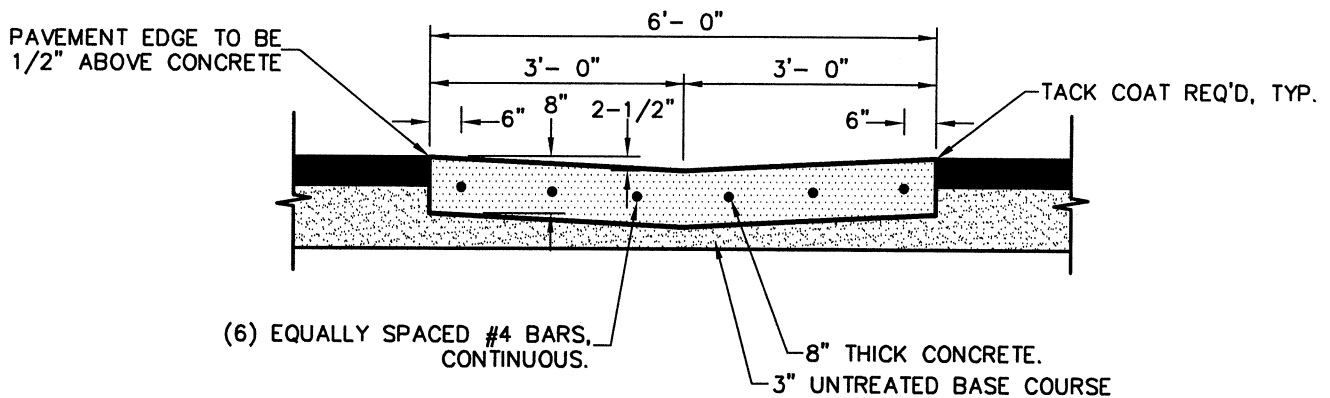
LAST UPDATE: 2/2/2009

11

NOTE: CONSTRUCT CROSS GUTTER TO DRAIN WITHOUT PONDING.



PLAN



SECTION A-A

CONCRETE CROSS GUTTER

NOTE: SEE TYPICAL CONCRETE JOINTS
ON STD. DWG. NO. RD-09

REVISIONS

DATE	APP. BY	REMARKS



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SCALE: NONE

RD-05

KANE COUNTY

RD-05

ROAD CONSTRUCTION

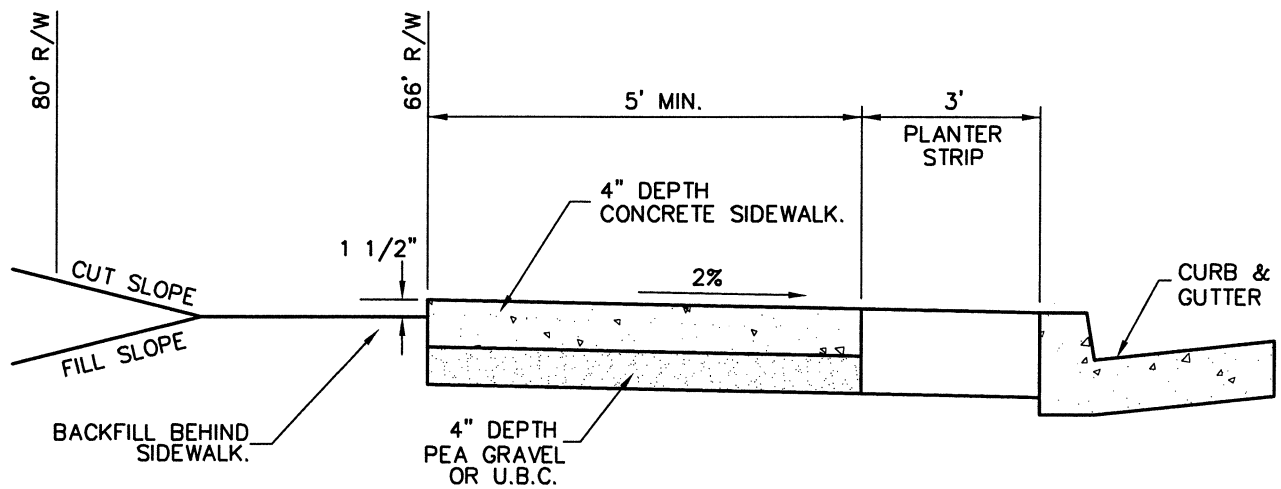
STANDARD DRAWING

DRAWN: KJ 02/09
CHECK: WM 02/09

PEN TBL: _1stndrd-ir2800.ctb
FILE: ROAD

PROJECT: 0901-014
LAST UPDATE: 2/2/2009

SHEET: 12



CONCRETE SIDEWALK DETAIL

REVISIONS		
DATE	APP. BY	REMARKS



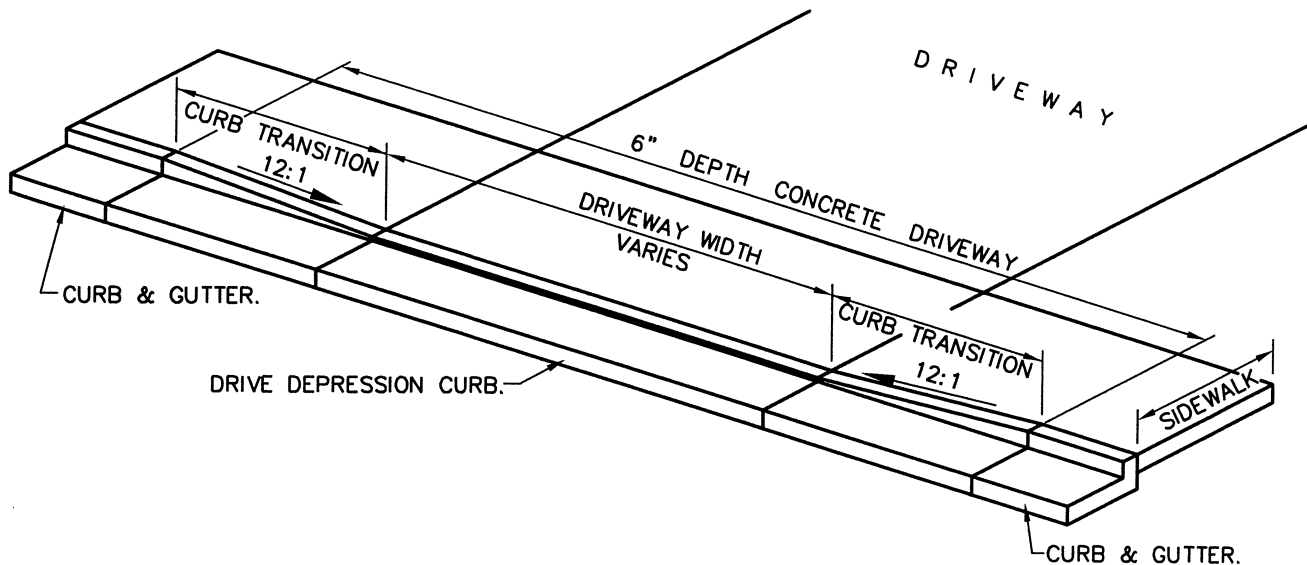
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SCALE: NONE

RD-06	KANE COUNTY	RD-06
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-jr2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD	LAST UPDATE: 3/9/2009
SHEET: 13		



TYPICAL CURB & GUTTER DRIVE DEPRESSION & TRANSITION DETAIL

REVISIONS		
DATE	APP. BY	REMARKS



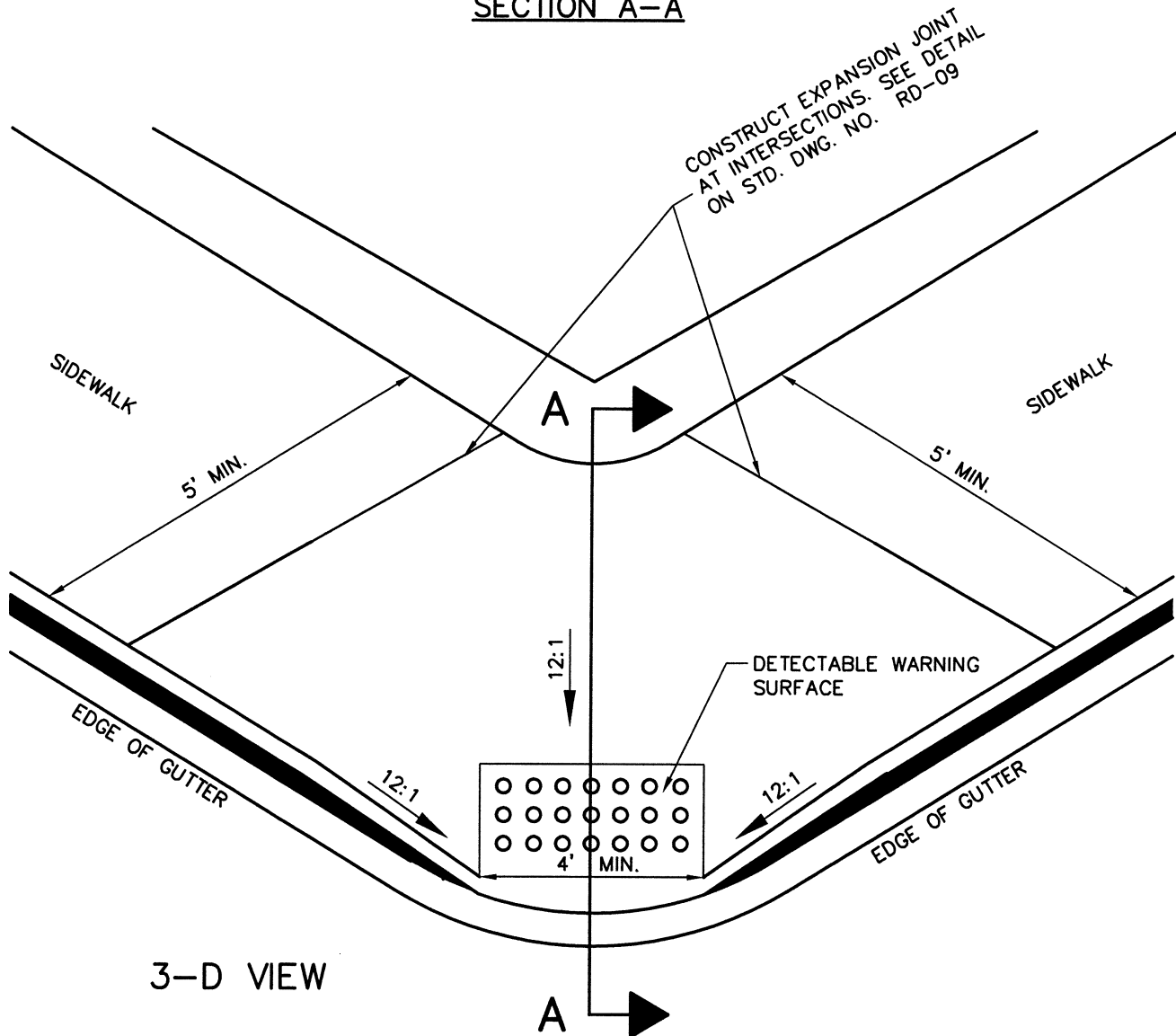
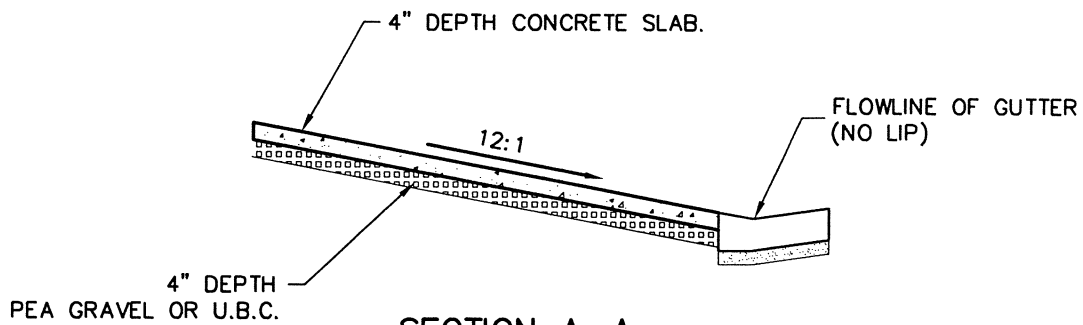
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SCALE: NONE

RD-07	KANE COUNTY	RD-07
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: 1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD	LAST UPDATE: 2/2/2009
		SHEET: 14



CURB RAMP DETAIL

REVISIONS		
DATE	APP. BY	REMARKS



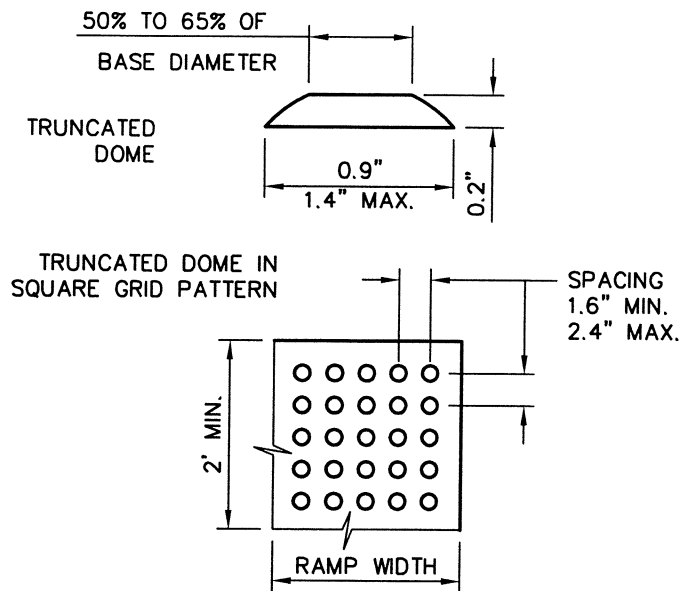
Jones & DeMille Engineering

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SCALE: NONE

RD-08	KANE COUNTY	RD-08
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: 1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD	LAST UPDATE: 2/2/2009
		SHEET: 15



DETECTABLE WARNING SURFACE DETAIL

CURB RAMP SLOPE TABLE			
	ITEM	MAX. RUNNING SLOPE *	MAX. CROSS SLOPE *
①	LANDING	2% (1V: 50H)	2% (1V: 50H)
Ⓜ	RAMP	8.33% (1V: 12H)	2% (1V: 50H)
①	TRANSITION	5% (1V: 20H) (o)	2% (1V: 50H)
	SIDEWALK	--	2% (1V: 50H)
	FLARE	10% (1V: 10H)	--

* RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL, WHILE CROSS SLOPE IS PERPENDICULAR TO PEDESTRIAN TRAVEL.

(o) TRANSITION RUNNING SLOPE NEEDS TO BE CONSTANT ACROSS ENTIRE CURB CUT. WARP GUTTER PAN TO MEET REQUIRED TRANSITION SLOPE AT CURB CUT.

NOTES:

1. CONFIGURATION OF RAMPS AND LANDINGS MAY VARY TO FIT SITE CONDITIONS, BUT MUST MEET DIMENSION AND SLOPE REQUIREMENTS.
2. PROVIDE DETECTABLE WARNING SURFACE FOR FULL WIDTH OF RAMP. SEE DETAIL FOR DETECTABLE WARNING SURFACE DIMENSIONS.
3. LOCATE DETECTABLE WARNING SURFACE SO THAT THE EDGE NEAREST THE STREET IS 6 OR 8 INCHES FROM THE CURB LINE.
4. PROVIDE DETECTABLE WARNING SURFACE THAT CONTRASTS WITH ADJACENT WALKING SURFACE, EITHER LIGHT-ON-DARK OR DARK-ON-LIGHT.
5. CURB RAMPS SHALL COMPLY WITH AMERICANS WITH DISABILITIES ACT (ADA) REQUIREMENTS.

REVISIONS

DATE	APP. BY	REMARKS



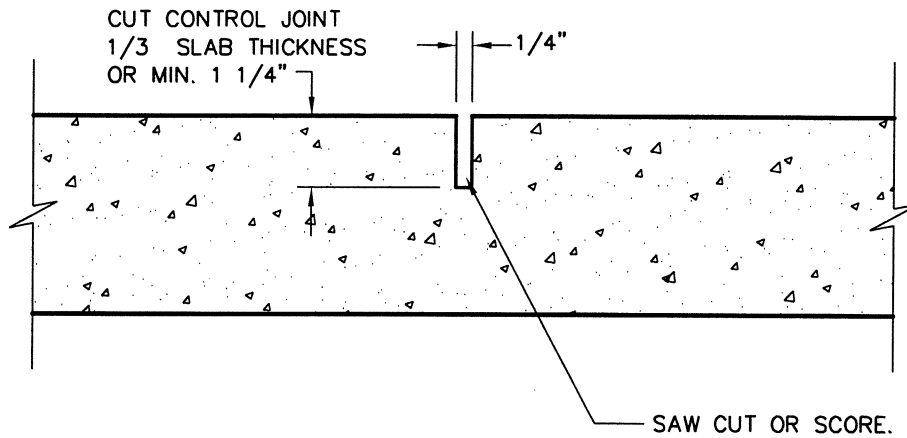
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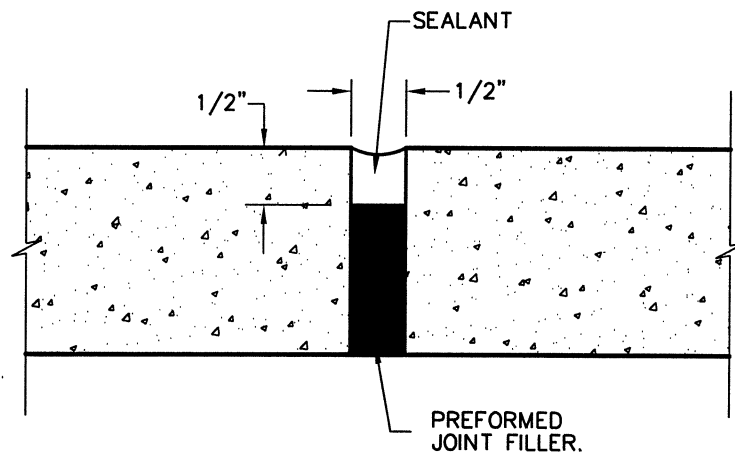


SCALE: NONE

RD-09	KANE COUNTY	RD-09
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD	LAST UPDATE: 2/12/2009
SHEET: 16		



CONTROL JOINT



EXPANSION JOINT

TYPICAL CONCRETE JOINTS

NOTE: USE FOR CURB & GUTTER,
CROSS GUTTER, AND SIDEWALK.

REVISIONS		
DATE	APP. BY	REMARKS



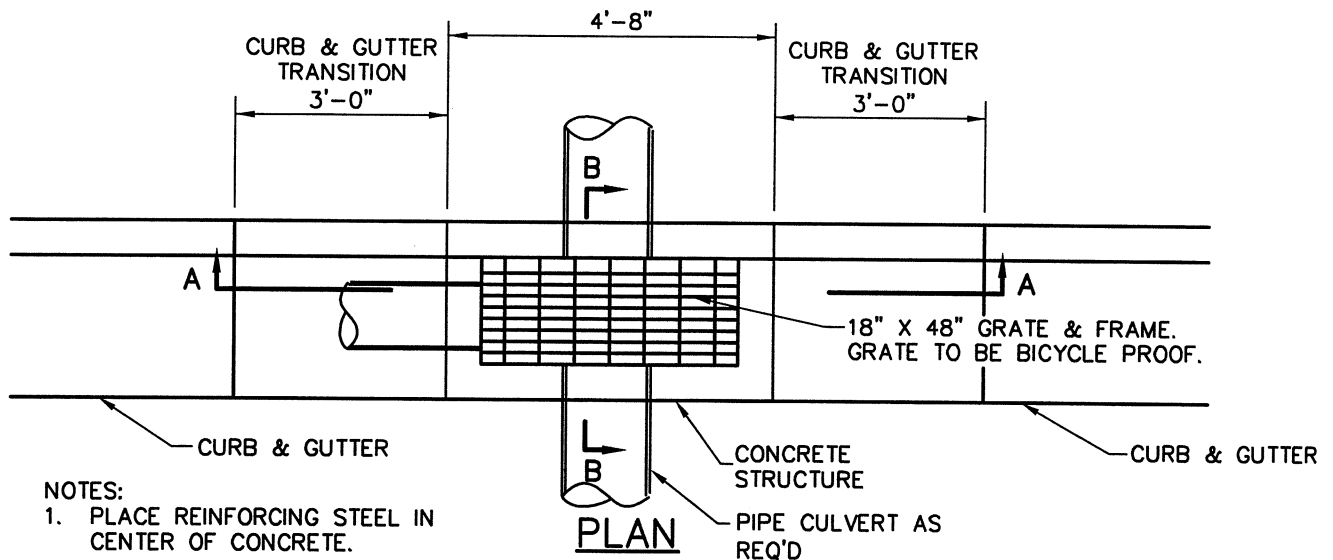
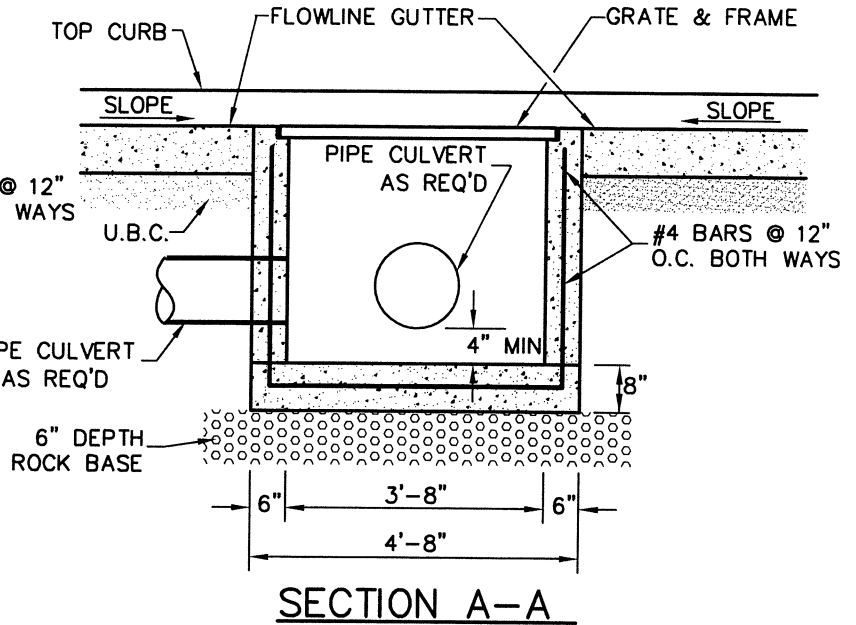
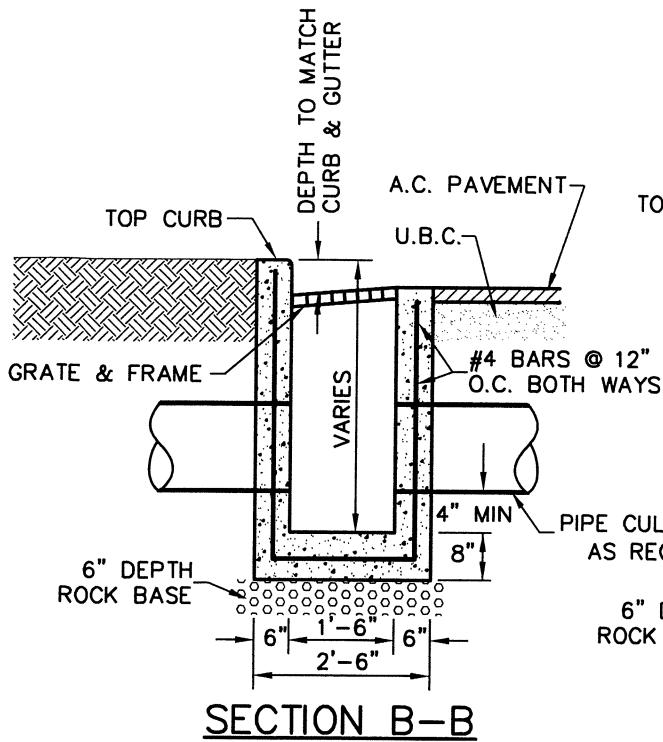
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SCALE: NONE

RD-10	KANE COUNTY	RD-10
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD	LAST UPDATE: 2/12/2009
		SHEET: 17



NOTES:
1. PLACE REINFORCING STEEL IN CENTER OF CONCRETE.

CATCH BASIN

REVISIONS		
DATE	APP. BY	REMARKS



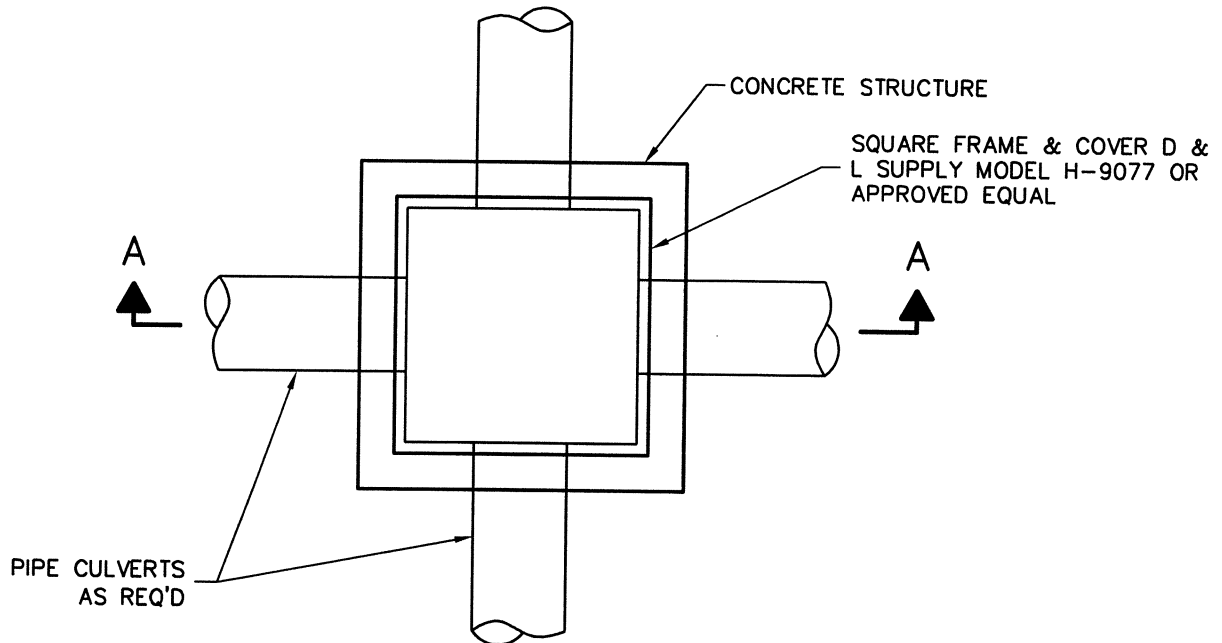
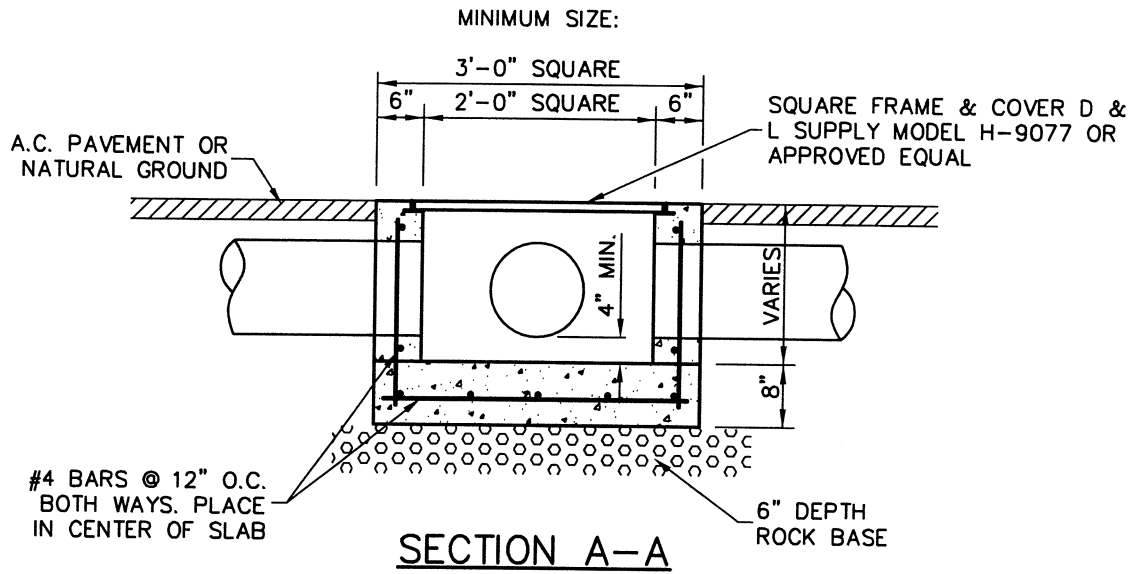
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SCALE: NONE

RD-11	KANE COUNTY	RD-11
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02-09	FILE: ROAD2	LAST UPDATE: 2/2/2009
		SHEET: 18



JUNCTION BOX

REVISIONS		
DATE	APP. BY	REMARKS



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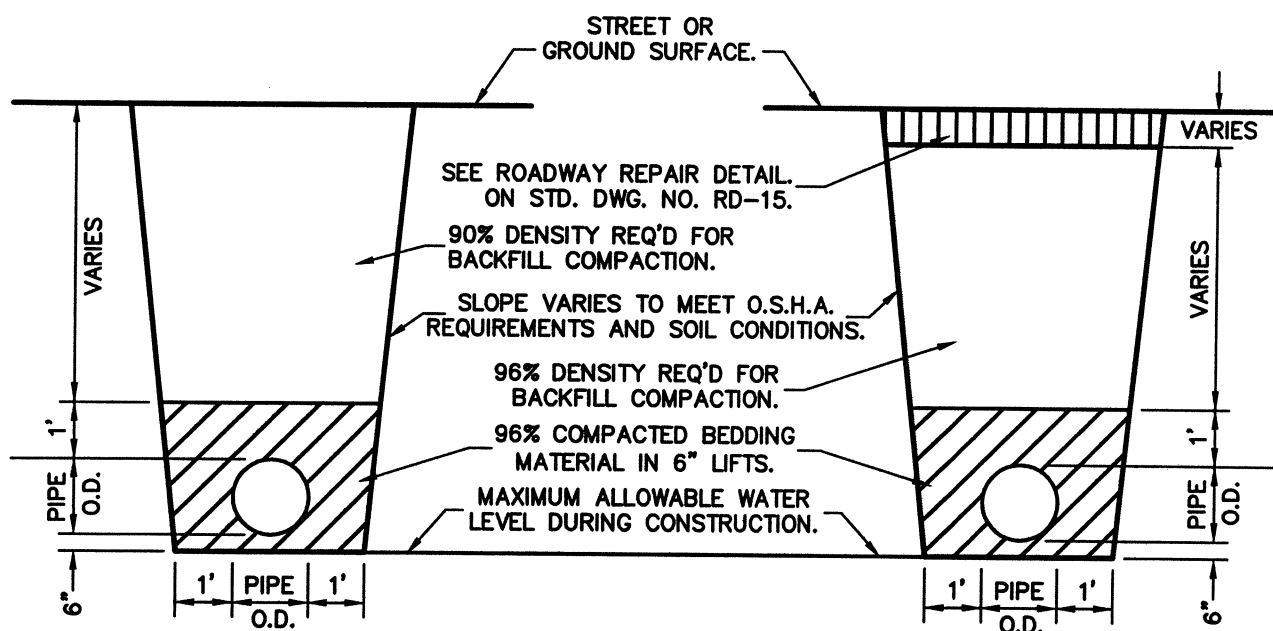
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SCALE: NONE

RD-12	KANE COUNTY	RD-12
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-1r2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD2	LAST UPDATE: 2/2/2009
		SHEET: 19

UTILITY	BURY DEPTH (MIN.)	CONDUIT	TRACER WIRE/ WARNING TAPE	REMARKS
WATER	4' 6' IN HIGH ELEVATIONS	NO	TRACER WIRE WARNING TAPE	CONSULT KANE CO. WATER CONSERV. DIST. AS NECESSARY
GAS	2.5' W/ SAND BEDDING	NO	18 GA. TRACER WIRE	PHONE OR FIBER SHALL NOT SHARE TRENCH
PHONE/FIBER	DROP OR SERVICE 2.25' MAIN PHONE OR LOCAL FIBER 3' INTER OFFICE FIBER 4'	ALL THREE	NO	CONSULT LOCAL PHONE CO. FOR SPECIAL CONDITIONS
POWER	PRIMARY 4' SECONDARY 3'	BOTH P & S	WARNING TAPE, 1' ABOVE CONDUCTOR	NO OTHER UTILITY WITHIN 2' CLEAR ZONE. BELOW WATER.
SEWER	VARIES	NO	WARNING TAPE, 2' ABOVE ALL PIPES	1.5' CLEAR BELOW WATER LINES



CLASS "D" BACKFILL
NON-TRAVELED AREAS

CLASS "B" BACKFILL
TRAVELED AREAS

UTILITY TRENCH DETAIL

REVISIONS

DATE	APP. BY	REMARKS



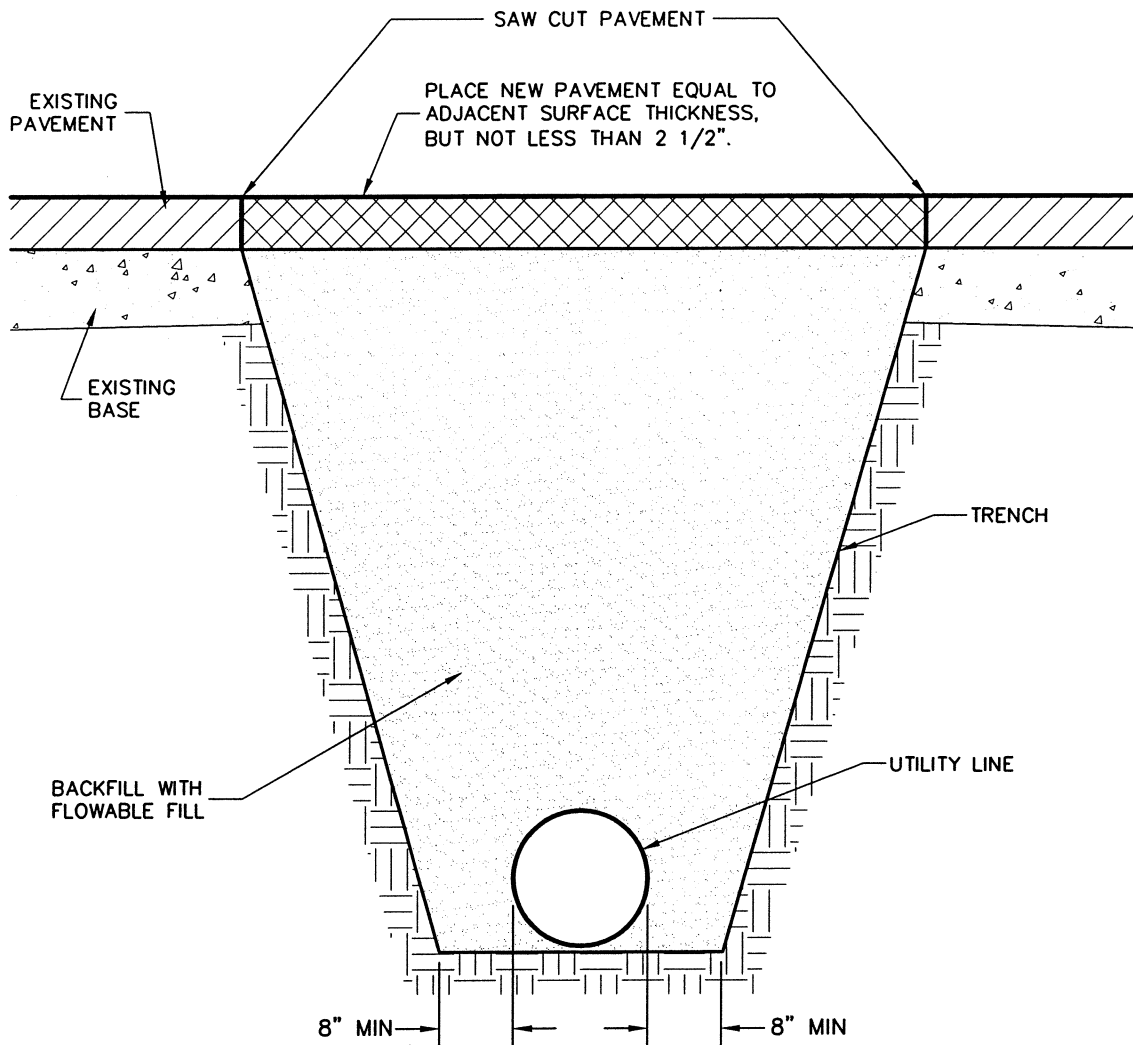
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SCALE: NONE

RD-13	KANE COUNTY	RD-13
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1etndrd-1r2800.cib	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD2	LAST UPDATE: 3/31/2009
		SHEET: 20



NOTES:

1. DO NOT PLACE NEW PAVEMENT OR PERMIT VEHICULAR TRAFFIC OVER TRENCH FOR AT LEAST 24 HOURS AFTER PLACING FLOWABLE FILL.
2. IF NEW PAVEMENT SURFACE WILL NOT BE PLACED WITHIN 7 DAYS AFTER TRENCHING, BACKFILL WITH FLOWABLE TO MATCH ELEVATION OF EXISTING PAVEMENT. REMOVE FLOWABLE FILL AS REQUIRED TO PLACE NEW PAVEMENT.

UTILITY TRENCH WITH FLOWABLE FILL

REQUIRED ON ALL CROSS CUTS IN EXISTING ROADS

REVISIONS

DATE	APP. BY	REMARKS



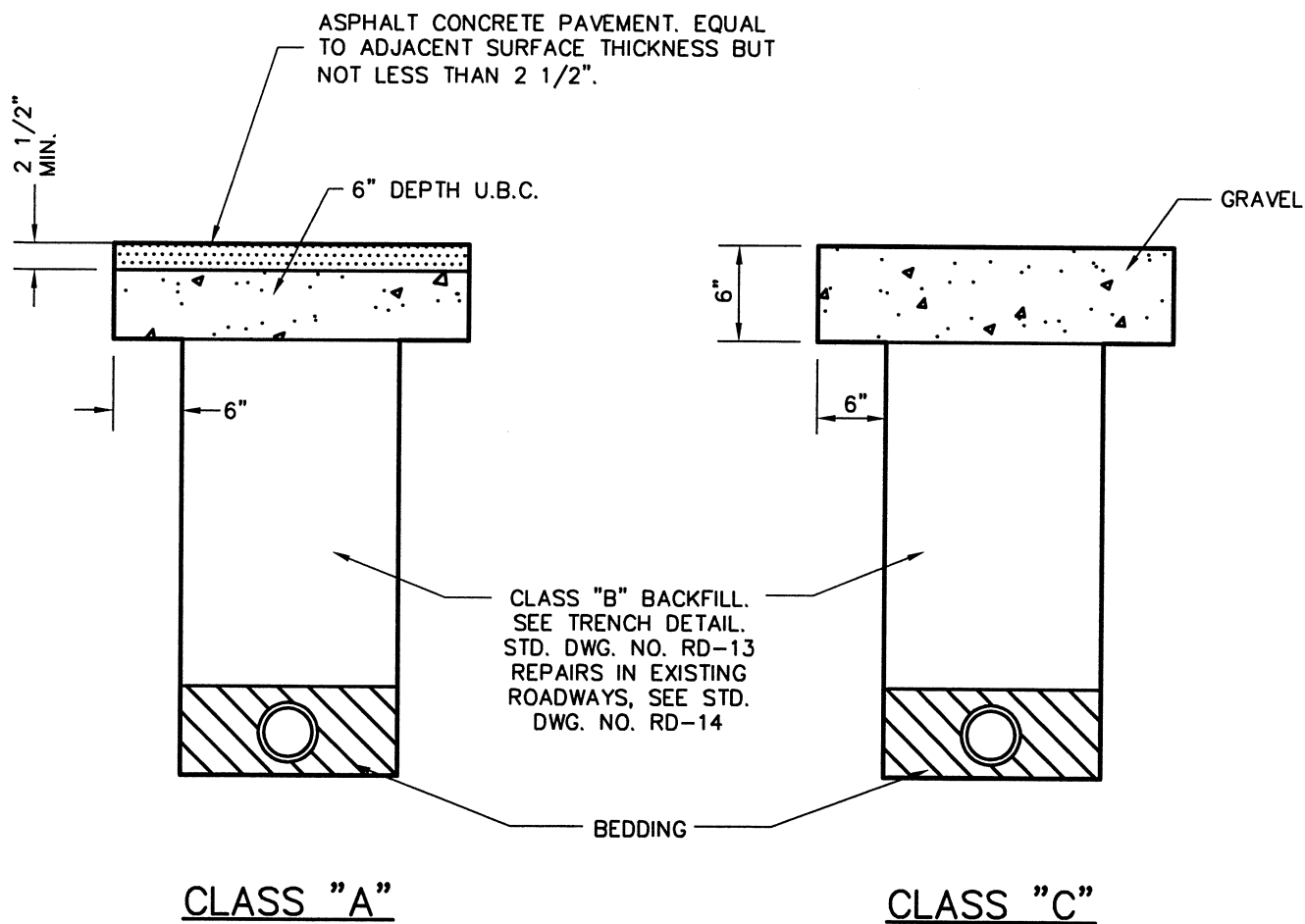
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SCALE: NONE

RD-14	KANE COUNTY	RD-14
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD2	LAST UPDATE: 2/13/2009
		SHEET: 21



ROADWAY REPAIR DETAIL

REVISIONS		
DATE	APP. BY	REMARKS



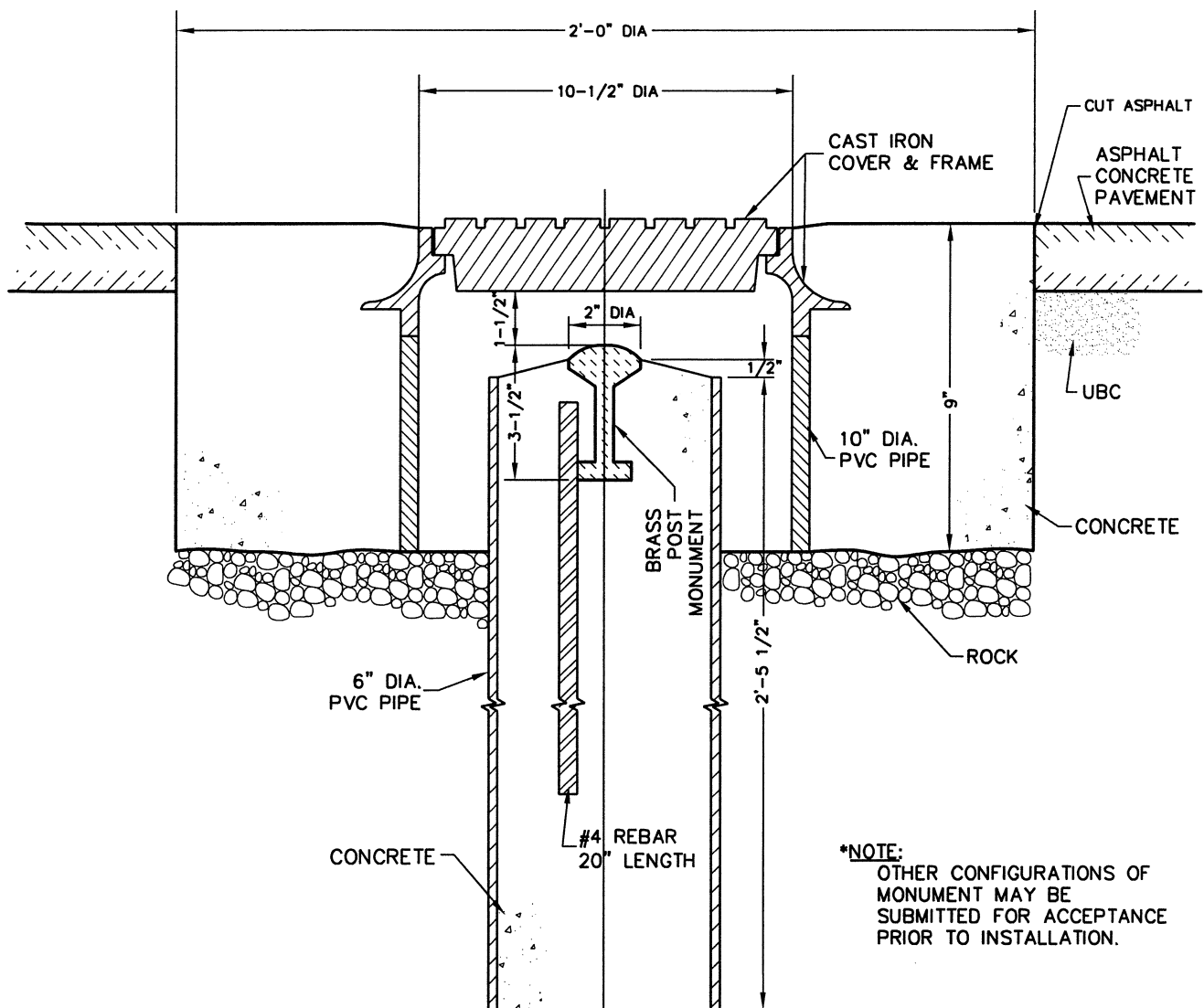
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SCALE: NONE

RD-15	KANE COUNTY	RD-15
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD2	LAST UPDATE: 2/13/2009
		SHEET: 22



STREET MONUMENT DETAIL

REVISIONS		
DATE	APP. BY	REMARKS



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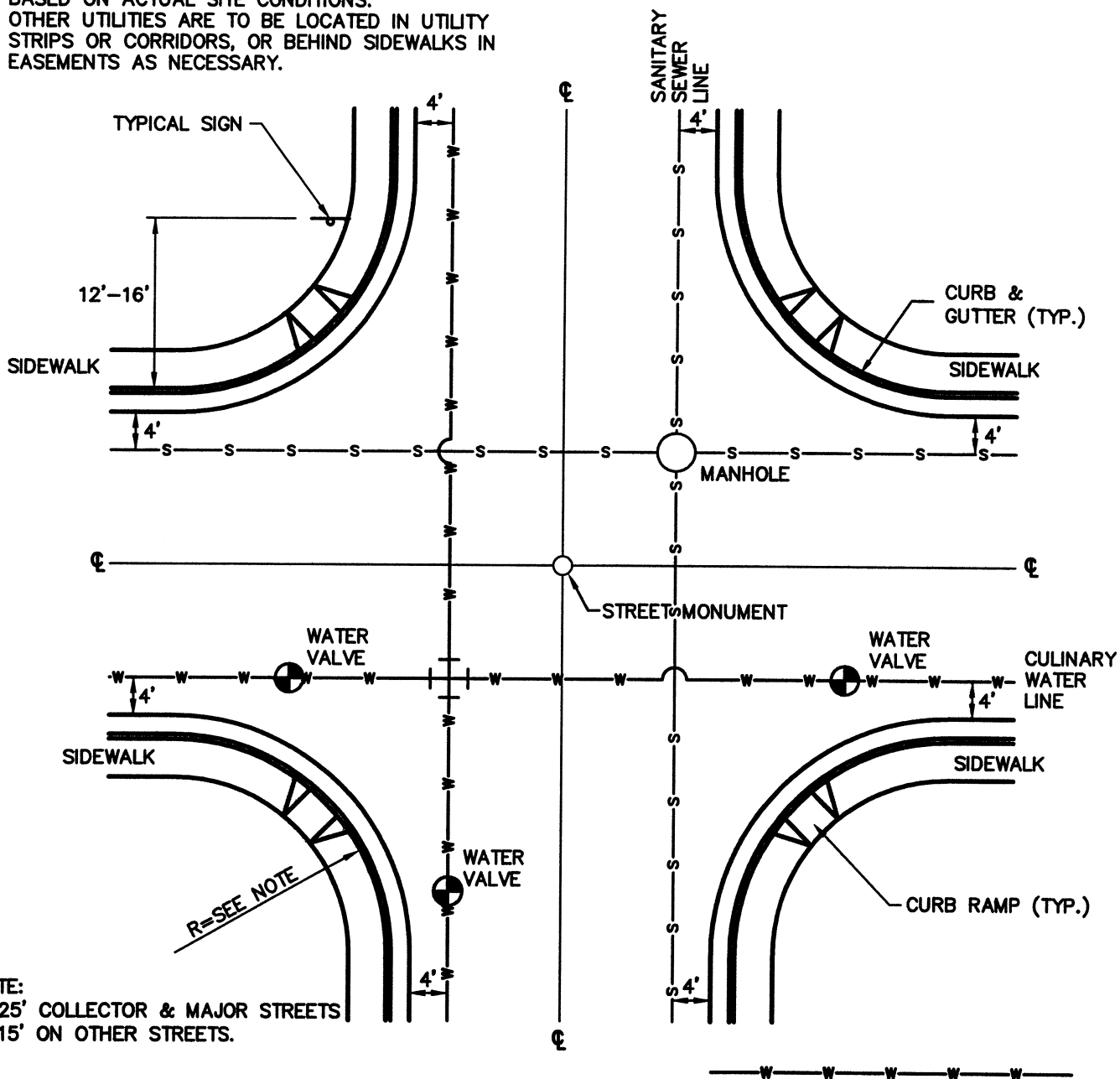


SCALE: NONE

RD-16	KANE COUNTY	RD-16
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD2	LAST UPDATE: 2/12/2009
		SHEET: 23

NOTES:

1. LOCATE CULINARY WATER & SANITARY SEWER LINES ON OPPOSITE SIDES OF STREET.
2. LOCATE WATER VALVES IN LINE WITH APPARENT PROPERTY LINES AND/OR FENCE LINES.
3. VARIATIONS OF INTERSECTIONS MAY BE ACCEPTABLE, BASED ON ACTUAL SITE CONDITIONS.
4. OTHER UTILITIES ARE TO BE LOCATED IN UTILITY STRIPS OR CORRIDORS, OR BEHIND SIDEWALKS IN EASEMENTS AS NECESSARY.



NOTE:

R=25' COLLECTOR & MAJOR STREETS
R=15' ON OTHER STREETS.

STREET INTERSECTION AND UTILITY LOCATION DETAIL

REVISIONS		
DATE	APP. BY	REMARKS



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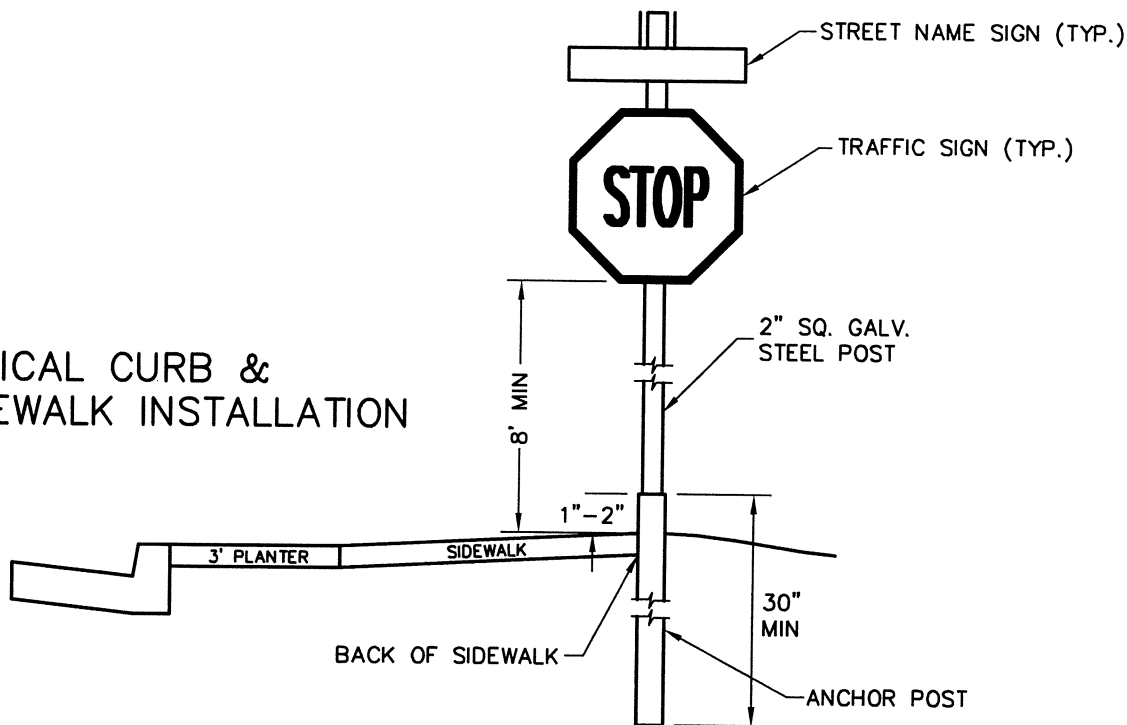
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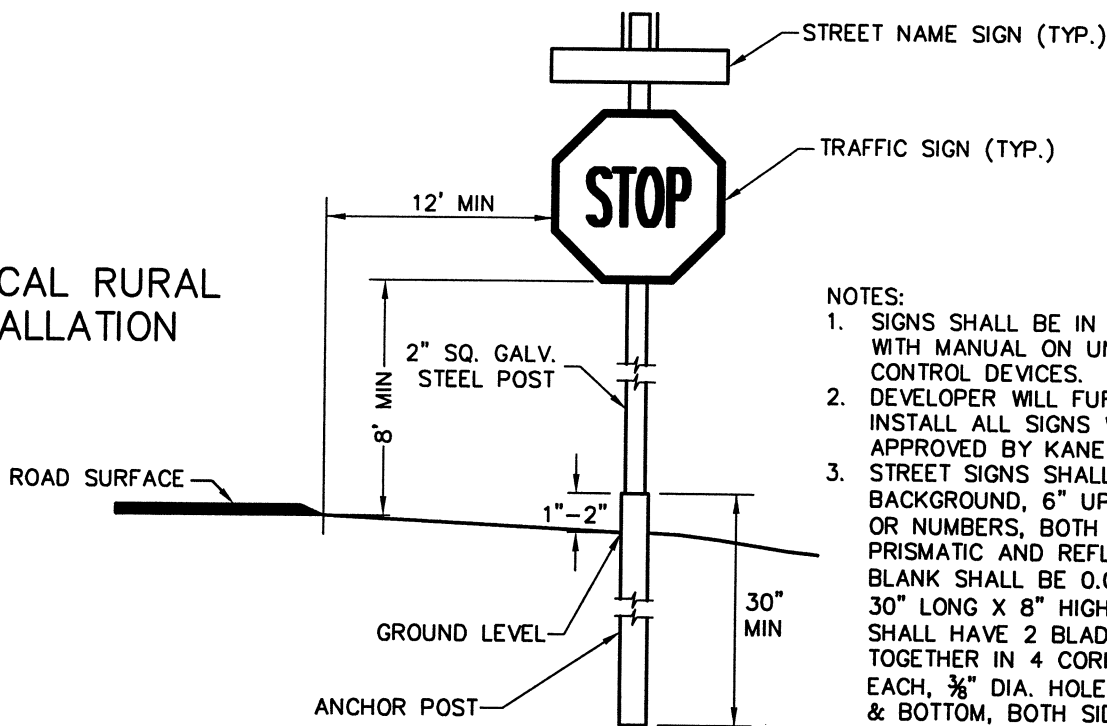
SCALE: NONE

RD-17	KANE COUNTY	RD-17
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-r2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD2	LAST UPDATE: 3/31/2009
		SHEET: 24

TYPICAL CURB & SIDEWALK INSTALLATION



TYPICAL RURAL INSTALLATION



NOTES:

1. SIGNS SHALL BE IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
2. DEVELOPER WILL FURNISH AND INSTALL ALL SIGNS WITH LOCATIONS APPROVED BY KANE COUNTY.
3. STREET SIGNS SHALL BE GREEN BACKGROUND, 6" UPPERCASE LETTERS OR NUMBERS, BOTH HIGH INTENSITY PRISMATIC AND REFLECTIVE. SIGN BLANK SHALL BE 0.08" THICKNESS, 30" LONG X 8" HIGH. EACH SIGN SHALL HAVE 2 BLADES RIVETED TOGETHER IN 4 CORNERS WITH 2 EACH, $\frac{3}{8}$ " DIA. HOLES IN CENTER TOP & BOTTOM, BOTH SIDES FOR POST ATTACHMENT.

SIGN & POST DETAIL

REVISIONS		
DATE	APP. BY	REMARKS



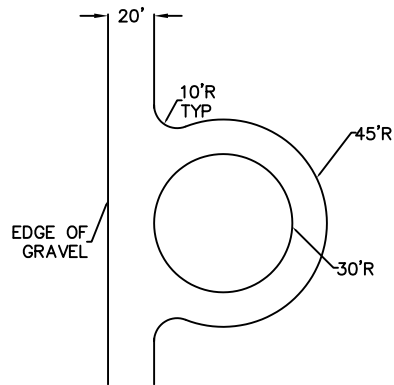
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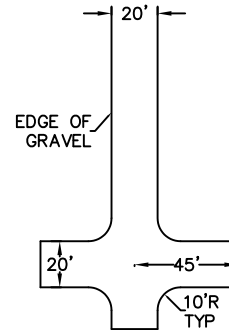


SCALE: NONE

RD-18	KANE COUNTY	RD-18
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-r2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD2	LAST UPDATE: 2/13/2009
		SHEET: 25

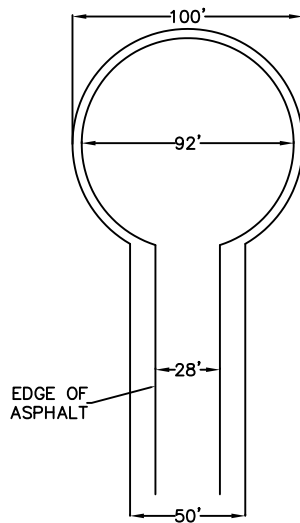


GRAVEL CIRCLE

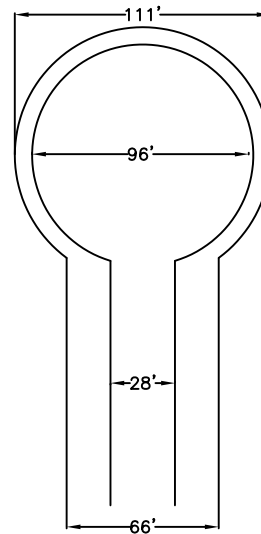


GRAVEL HAMMER HEAD

WILDLAND URBAN INTERFACE ONLY

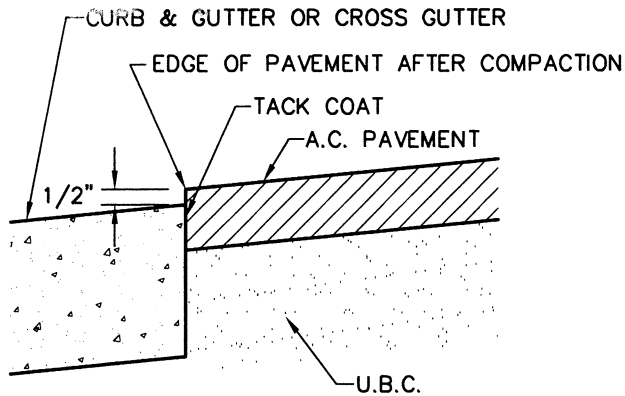


92' CUL-DE-SAC

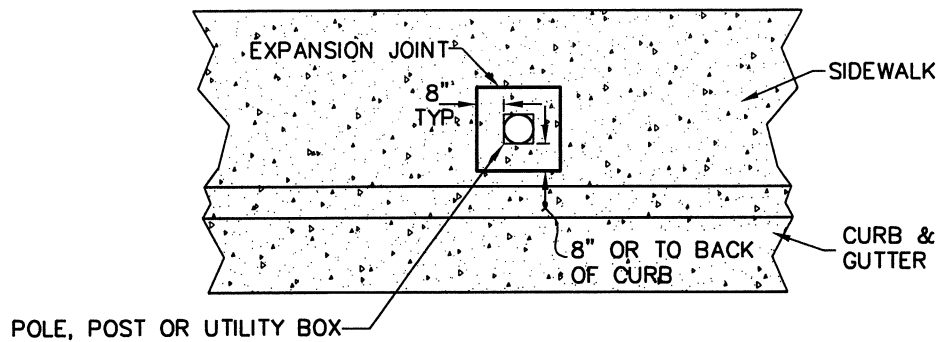


96' CUL-DE-SAC

TURNAROUND



PAVEMENT EDGE DETAIL



TYPICAL EXPANSION JOINT AROUND OBJECTS

REVISIONS		
DATE	APP. BY	REMARKS

NOTE:
1. SEE EXPANSION JOINT DETAIL
ON STD. DWG. NO. RD-09



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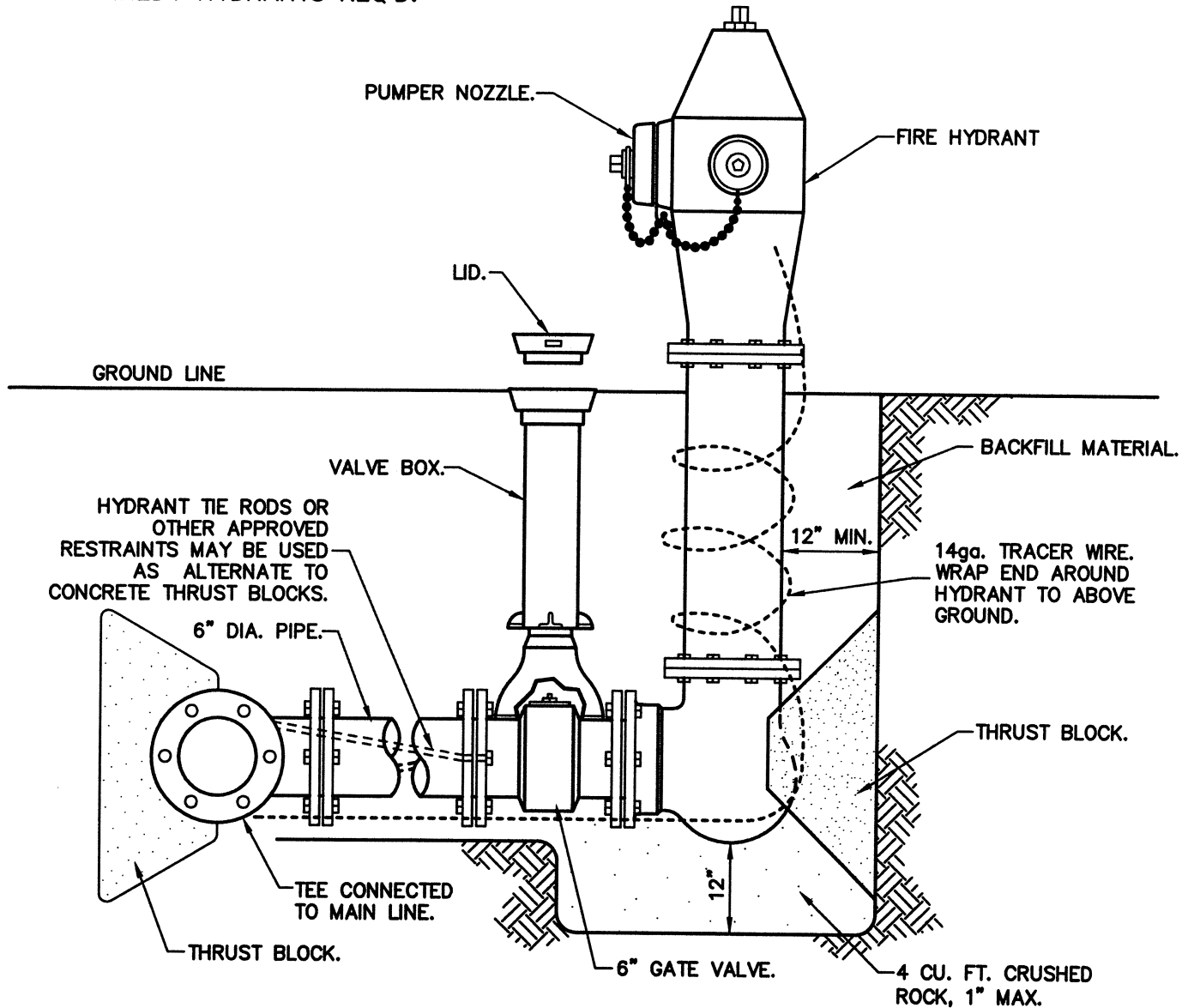


SCALE: NONE

RD-20	KANE COUNTY	RD-20
ROAD CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ROAD2	LAST UPDATE: 2/2/2009
		SHEET: 27

KCWCD ADDITIONAL REQUIREMENTS:

1. 12 GAUGE TRACER WIRE REQ'D.
2. GATE VALVE TO BE BOLTED TO MAIN LINE TEE.
3. A 5' TALL MARKER SHALL BE INSTALLED BY HYDRANT IN HIGH ELEVATIONS.
4. 6' BURY HYDRANTS REQ'D IN HIGH ELEVATIONS.
5. KENNEDY HYDRANTS REQ'D.



FIRE HYDRANT DETAIL

REVISIONS		
DATE	APP. BY	REMARKS



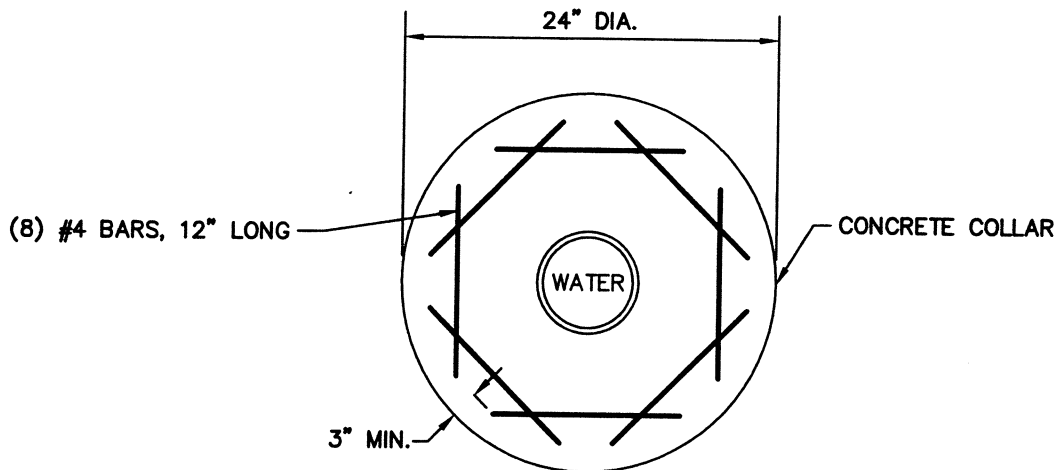
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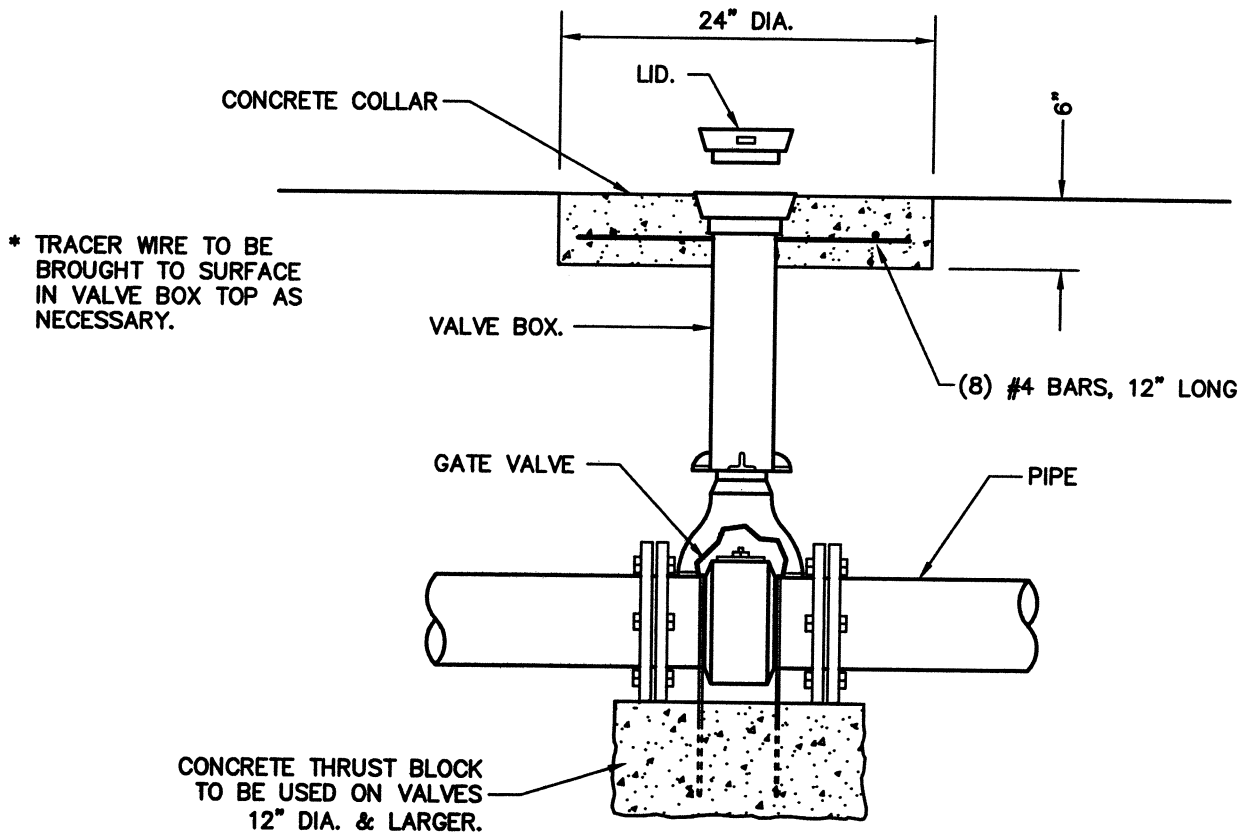


SCALE: NONE

CW-01	KANE COUNTY	CW-01
CULINARY WATER CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-lr2800.cdb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: WATER	LAST UPDATE: 3/9/2009
		SHEET: 28



PLAN



SECTION

GATE VALVE DETAIL

REVISIONS

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SCALE: NONE

CW-02

KANE COUNTY

CW-02

CULINARY WATER CONSTRUCTION

STANDARD DRAWING

DRAWN: KJ 02/09

PEN TBL: _1stndrd-fr2800.ctb

PROJECT: 0901-014

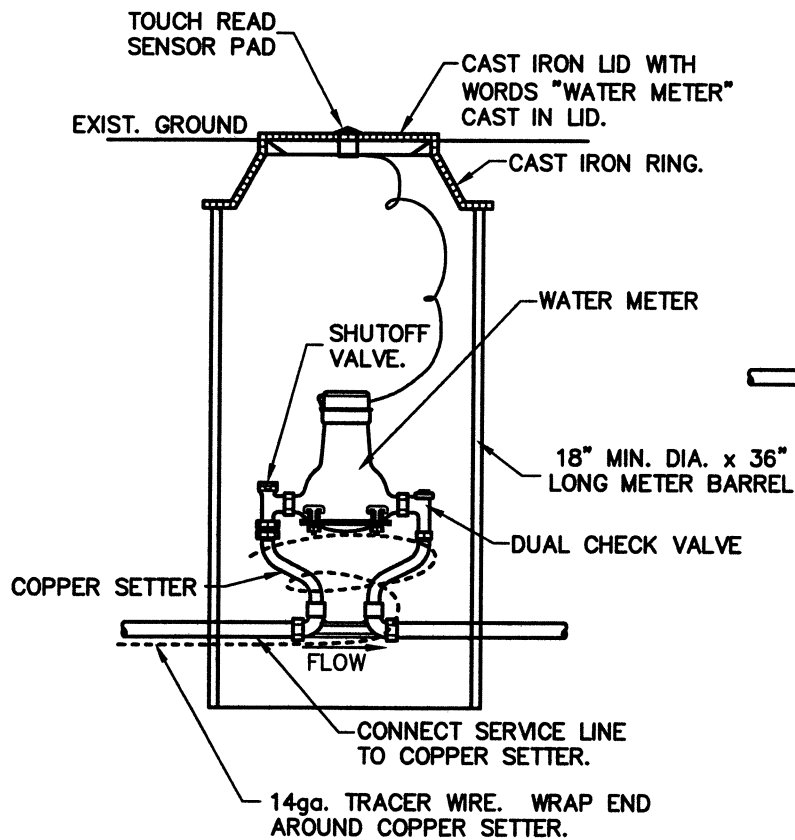
SHEET:

CHECK: WM 02/09

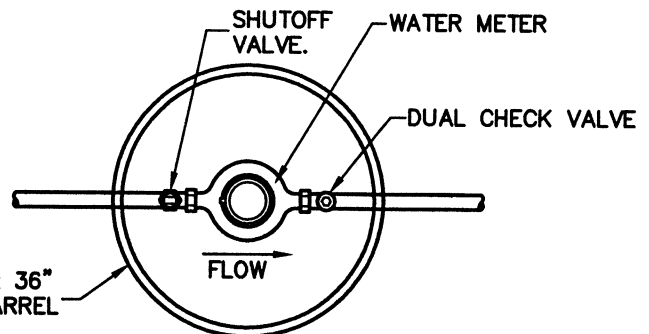
FILE: WATER

LAST UPDATE: 3/31/2009

29



METER SECTION



METER PLAN

METER BOX DETAIL

NOTES:

1. IN HIGH ELEVATIONS WITH DEEPER FROST LINES, METER SETS AND BARRELS SHALL BE 6 FT. MINIMUM DEPTH. MUELLER/MCCULLOUGH THERMAL-COIL METER BOX, OR APPROVED EQUAL, PRE-ASSEMBLED IS OPTIONAL TO PROVIDE FROST PROTECTION. VERIFY REQUIREMENTS OF LOCAL WATER UTILITY PROVIDER AS NECESSARY.
2. A 6' BLUE MARKER BY BARREL AND 12 GAUGE TRACER WIRE REQ'D BY KCWCD.

REVISIONS

DATE	APP. BY	REMARKS



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SCALE: NONE

CW-03

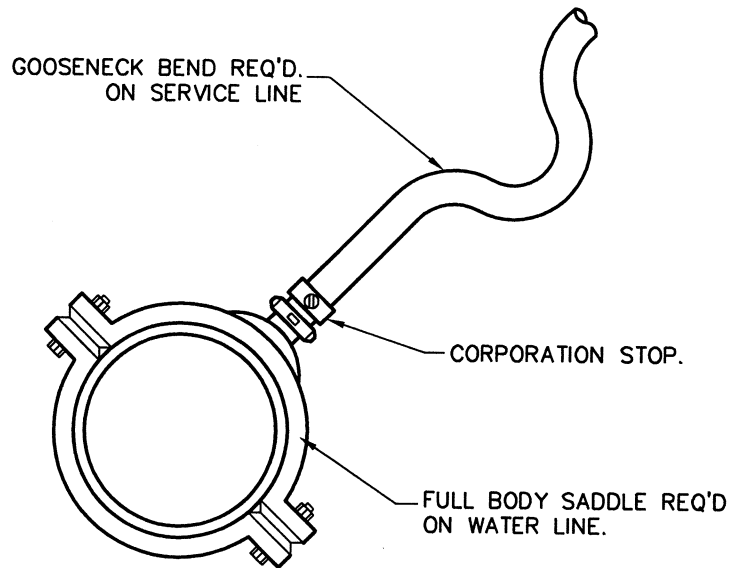
KANE COUNTY

CW-03

CULINARY WATER CONSTRUCTION

STANDARD DRAWING

DRAWN: KJ 02/09	PEN TBL: _1stndrd-1r2800.ctb	PROJECT: 0901-014	SHEET: 30
CHECK: WM 02/09	FILE: WATER	LAST UPDATE: 3/31/2009	



WATER SERVICE CONNECTION DETAIL

REVISIONS		
DATE	APP. BY	REMARKS



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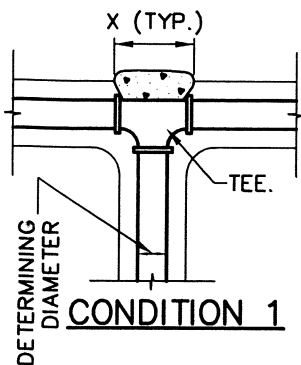
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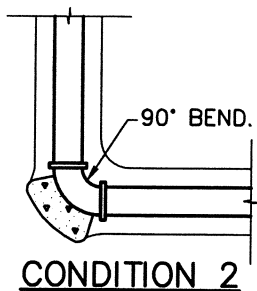
SCALE: NONE

CW-04	KANE COUNTY	CW-04
CULINARY WATER CONTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: WATER	LAST UPDATE: 2/2/2009
		SHEET: 31

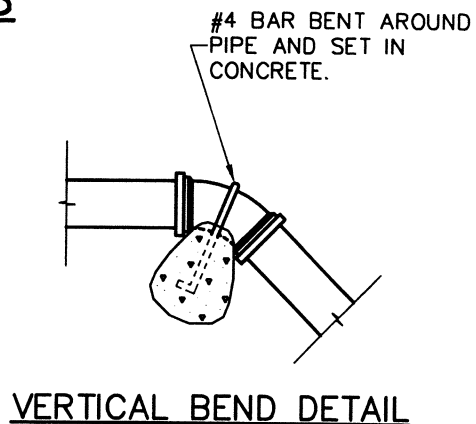
THRUST BLOCKS



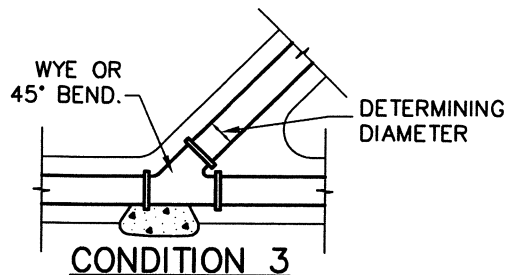
CONDITION 1



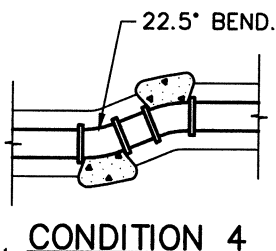
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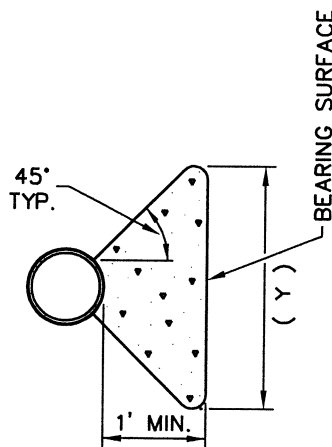
VERTICAL BEND DETAIL



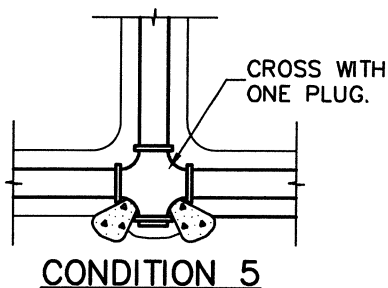
CONDITION 3



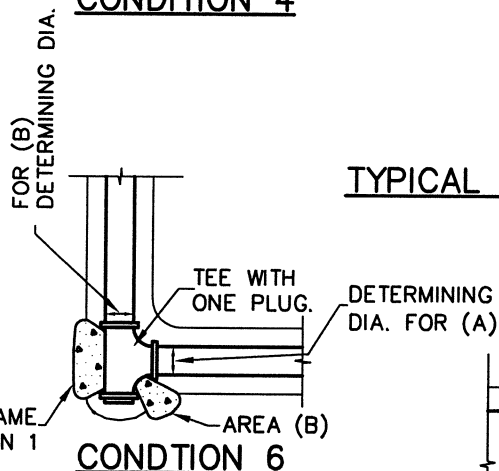
CONDITION 4



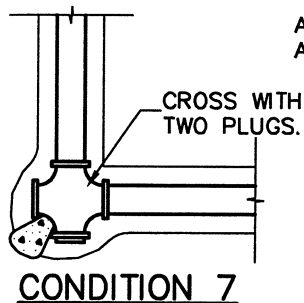
TYPICAL THRUST BLOCK SECTION



CONDITION 5

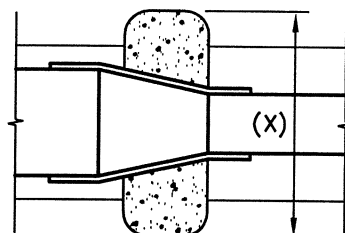


CONDITION 6



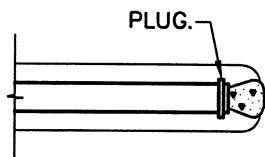
CONDITION 7

AREA (A) SAME AS CONDITION 1
AREA (B)



REDUCER THRUST BLOCK

8" x 4" REDUCER - BEARING AREA = 7.5 SQ. FT.
8" x 6" REDUCER - BEARING AREA = 4.4 SQ. FT.
10" x 6" REDUCER - BEARING AREA = 10.0 SQ. FT.
10" x 8" REDUCER - BEARING AREA = 5.6 SQ. FT.
12" x 6" REDUCER - BEARING AREA = 17.0 SQ. FT.
12" x 10" REDUCER - BEARING AREA = 6.9 SQ. FT.



CONDITION 8

NOTE: SEE STANDARD DRAWING NO. CW-06 FOR THRUST BLOCK BEARING AREAS.

REVISIONS

DATE	APP. BY	REMARKS



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SCALE: NONE

CW-05


KANE COUNTY

CW-05

CULINARY WATER CONSTRUCTION

STANDARD DRAWING

DRAWN: KJ	02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014	SHEET: 32
CHECK: WM	02/09	FILE: WATER	LAST UPDATE: 2/2/2009	

THRUST BLOCK BEARING AREA (X) x (Y)								
PIPE SIZE	CONDITION NUMBER & PIPE WORKING PRESSURE							
	1	2	3	4	*5	6 (B)	7	8
	200	200	200	200	200	200	200	200
2"	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4"	2.5	3.5	1.9	1.0	1.8	1.8	3.5	2.5
6"	5.7	8.0	4.4	2.2	4.0	4.0	8.0	5.7
8"	10.1	14.2	7.7	3.9	7.1	7.1	14.2	10.1
10"	15.7	22.2	12.1	6.1	11.1	11.1	22.2	15.7
12"	22.6	31.9	17.4	8.8	16.0	16.0	31.9	22.6

* NOTE: BEARING AREAS ARE IN SQUARE FEET.
AREA APPLIES TO EACH INDIVIDUAL BLOCK (2 REQ'D).

NOTES

1. ALL THRUST BLOCKS SHALL BE POURED WITH BEARING SURFACES AGAINST UNDISTURBED EARTH OR AN APPROVED COMPACTED FILL.
2. CONCRETE SHALL BE 2500 psi OR HIGHER.
3. ALL THRUST BLOCK SIDES SHALL BE FORMED.
4. ALLOWABLE SOIL BEARING PRESSURE ASSUMED TO BE 1000 psi.
5. THE RATIO OF "X" TO "Y" (THRUST BLOCK AREA) SHALL BE NO GREATER THAN 3:1.
6. MINIMUM CURE TIME FOR THRUST BLOCKS IS 3 DAYS PRIOR TO PRESSURIZING SYSTEM.
7. THRUST BLOCKS SHALL NOT INTERFERE WITH NUTS & BOLTS OF FITTINGS.
8. SEE PIPE CONDITIONS ON STD. DWG. NO. CW-05.
9. INSTALL MECHANICAL JOINT RESTRAINT ON ALL JOINTS OF FITTINGS.
10. APPROVED MECHANICAL RESTRAINED JOINTS MAY BE USED AS ALTERNATE TO CONCRETE THRUST BLOCKS. SEE STD. DWG. NO. CW-07.

REVISIONS		
DATE	APP. BY	REMARKS



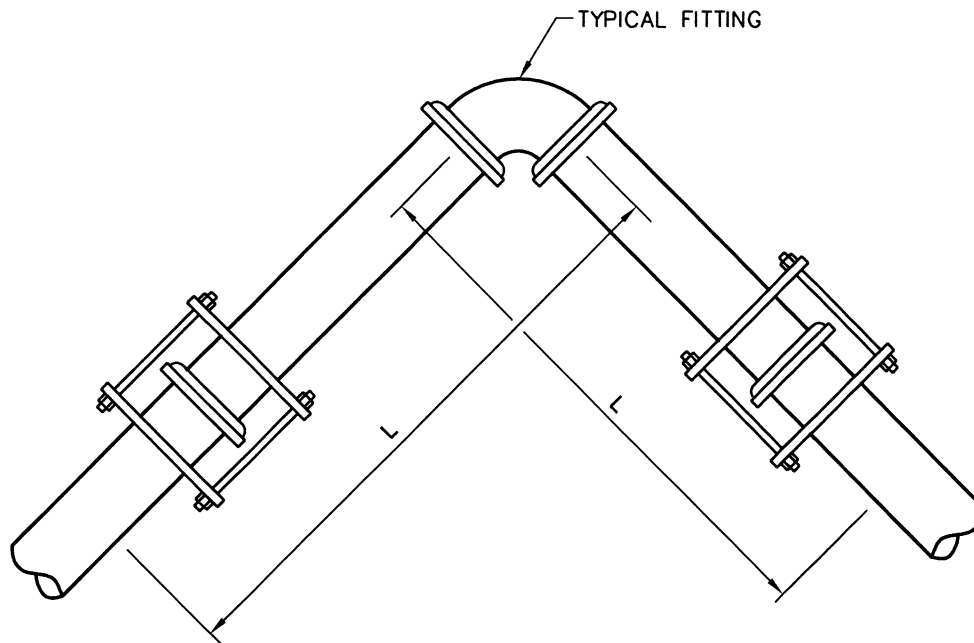
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SCALE: NONE

CW-06	KANE COUNTY	CW-06
CULINARY WATER CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: WATER	LAST UPDATE: 2/2/2009
		SHEET: 33



PLAN

TYPICAL RESTRAINED JOINTS

NOTES

1. ALL JOINTS WITHIN DISTANCE "L" SHALL BE RESTRAINED.
2. RESTRAIN JOINTS ON FITTING.
3. DISTANCE REQ'D FOR JOINT RESTRAINTS DEPENDS ON FITTING TYPE, SOIL TYPE AND WORKING PRESSURE.
4. DESIGN CRITERIA:
 - a. WORKING PRESSURE: 200 p.s.i.
 - b. SAFETY FACTOR: 1.5.
5. DISTANCE REQUIRED FOR JOINT RESTRAINTS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

REVISIONS

DATE	APP. BY	REMARKS



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SCALE: NONE

CW-07

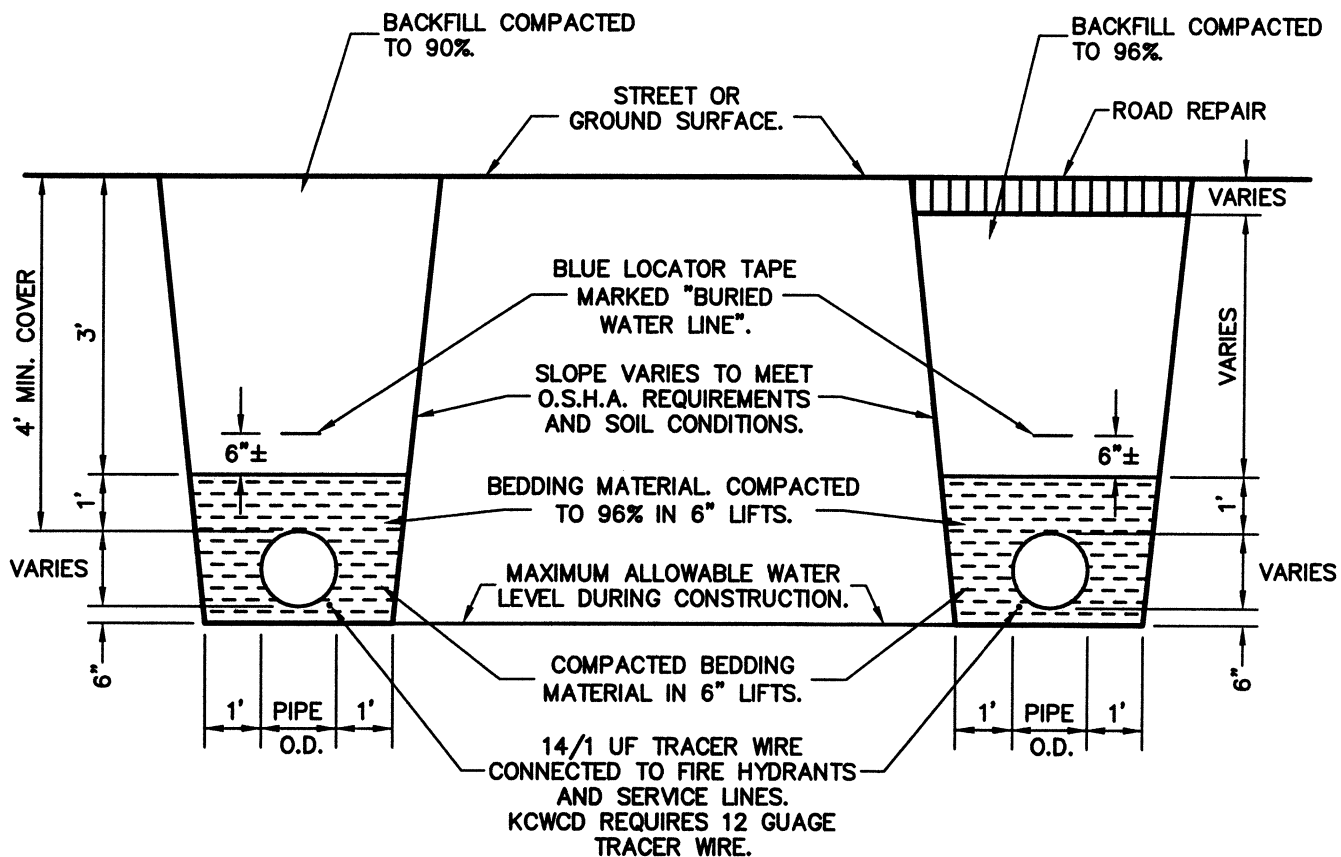
KANE COUNTY

CW-07

CULINARY WATER CONSTRUCTION

STANDARD DRAWING

DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014	SHEET: 34
CHECK: WM 02/09	FILE: WATER	LAST UPDATE: 2/2/2009	



CLASS "D" BACKFILL
NON-TRAVELED AREAS

CLASS "B" BACKFILL
TRAVELED AREAS

UTILITY TRENCH DETAIL

NOTE:

1. FLOWABLE FILL MAY BE USED IN PLACE OF COMPACTED BACKFILL. SEE STANDARD DRAWING RD-14
2. REFER TO SHEET RD-13 FOR ADDITIONAL INFORMATION.

REVISIONS

DATE	APP. BY	REMARKS



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SCALE: NONE

CW-08

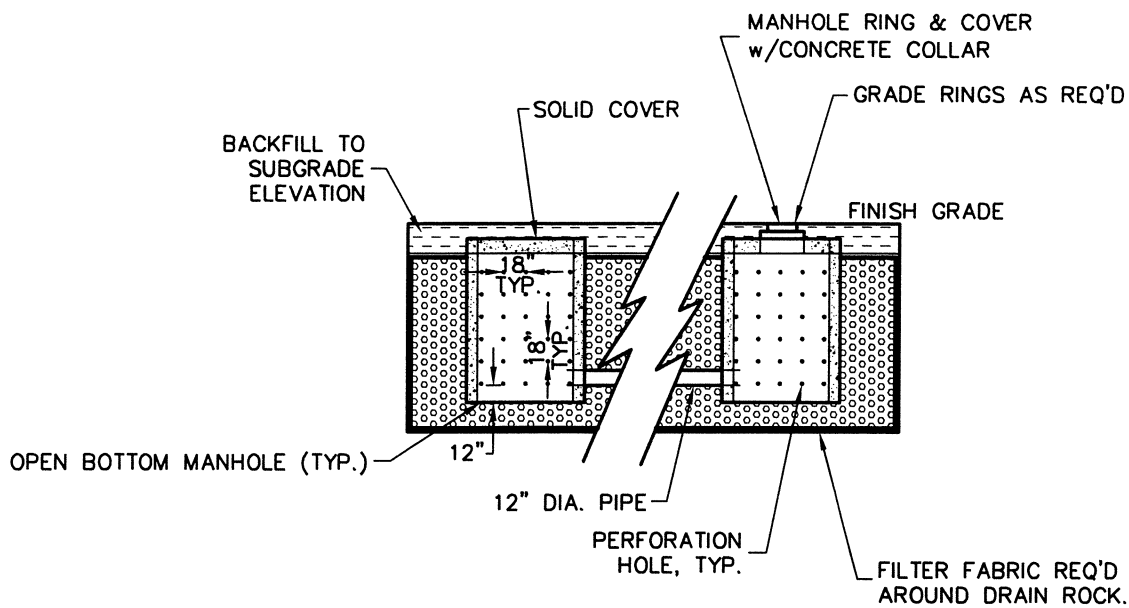
KANE COUNTY

CW-08

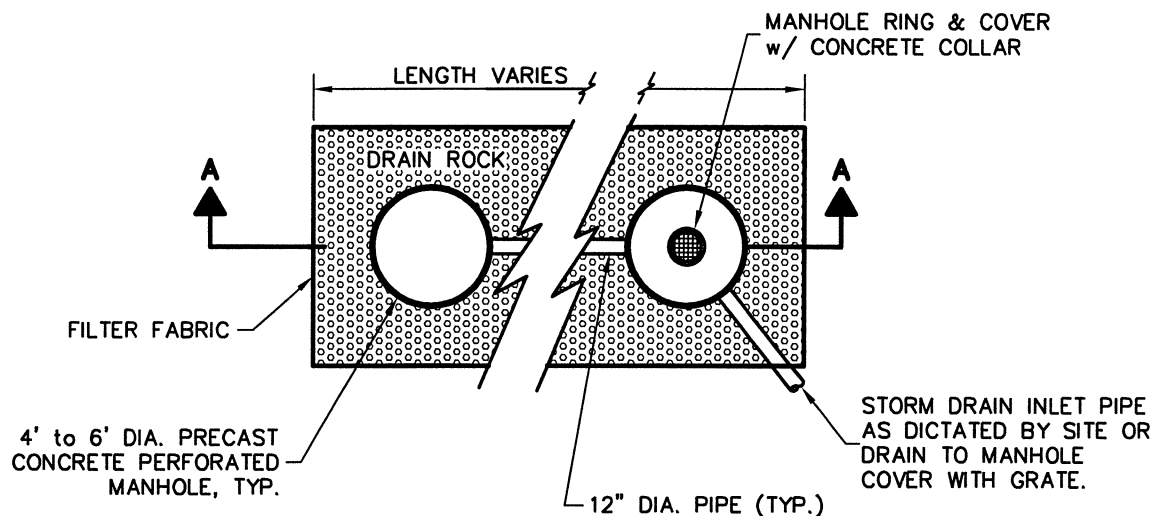
CULINARY WATER CONSTRUCTION

STANDARD DRAWING

DRAWN: KJ 02/09	PEN TBL: _1stndrd-1r2800.ctb	PROJECT: 0901-014	SHEET: 35
CHECK: WM 02/09	FILE: WATER	LAST UPDATE: 3/31/2009	



SECTION A-A



PLAN

STANDARD DRY WELL DETAIL

- NOTES:
1. INSTALL RING & COVER ON EACH MANHOLE WITH INLET PIPE.
 2. NUMBER OF MANHOLES & SIZE DICTATED BY DRAINAGE AREA.
 3. SIZE TO STORE MINIMUM 1 INCH DEPTH OF WATER OVER DRAINAGE AREA. CALCULATION SHOULD INCLUDE APPROPRIATE RUNOFF COEFFICIENT (C). SIZE IS BASED ON 10 YEAR 2 HOUR STORM EVENT.
 4. SEE SS-03 FOR CONCRETE COLLAR DETAIL.
 5. DRY WELL NOT PERMITTED IN NON-PERMEABLE SOILS OR AREAS WITH HIGH GROUND WATER TABLE.

REVISIONS		
DATE	APP. BY	REMARKS



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SCALE: NONE

SS-01	KANE COUNTY	SS-01
STORM SEWER CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: SEWER	LAST UPDATE: 2/2/2009
		SHEET: 36



2. WHEN MANHOLE IS WITHIN PAVED STREET,
CONSTRUCT CONCRETE COLLAR. SEE SS-03.

REVISIONS		
DATE	APP. BY	REMARKS



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SCALE: NONE

SS-02

KANE COUNTY

SS-02

STORM SEWER CONSTRUCTION

STANDARD DRAWING

DRAWN: KJ 02/09

PEN	1stdpd.ir2800.etc
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PROJECT: 0901-014

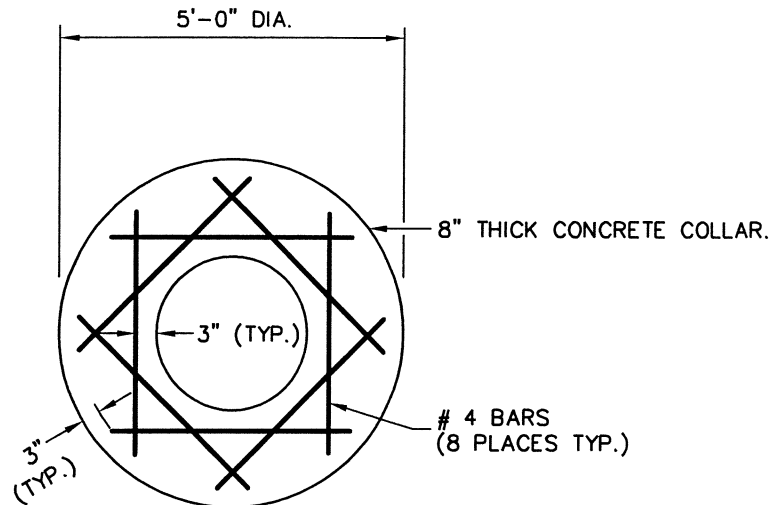
SHEET:

CHECK: WM 02/09

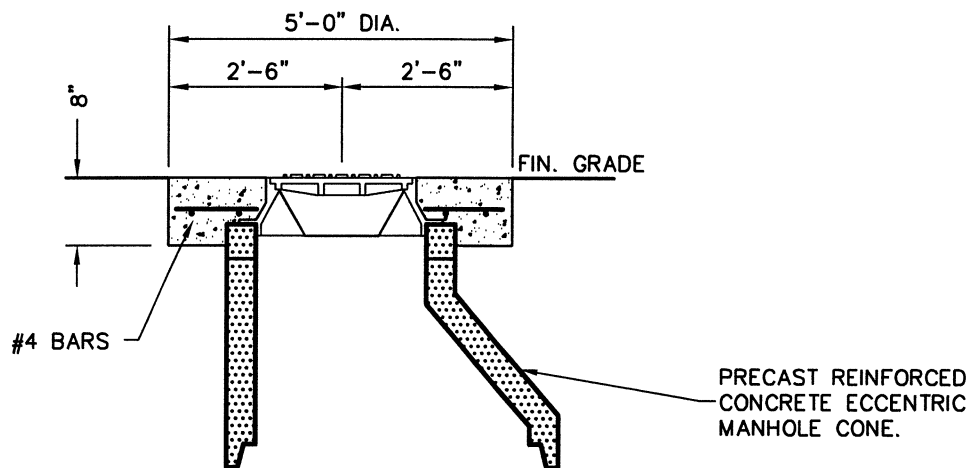
FILE:	SEWER
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LAST UPDATE:	2/2/2009
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PLAN



SECTION

MANHOLE CONCRETE COLLAR

NOTES: 1. USE GRADE RINGS AS NECESSARY TO ARRIVE AT REQ'D FINISH GRADE.

REVISIONS		
DATE	APP. BY	REMARKS



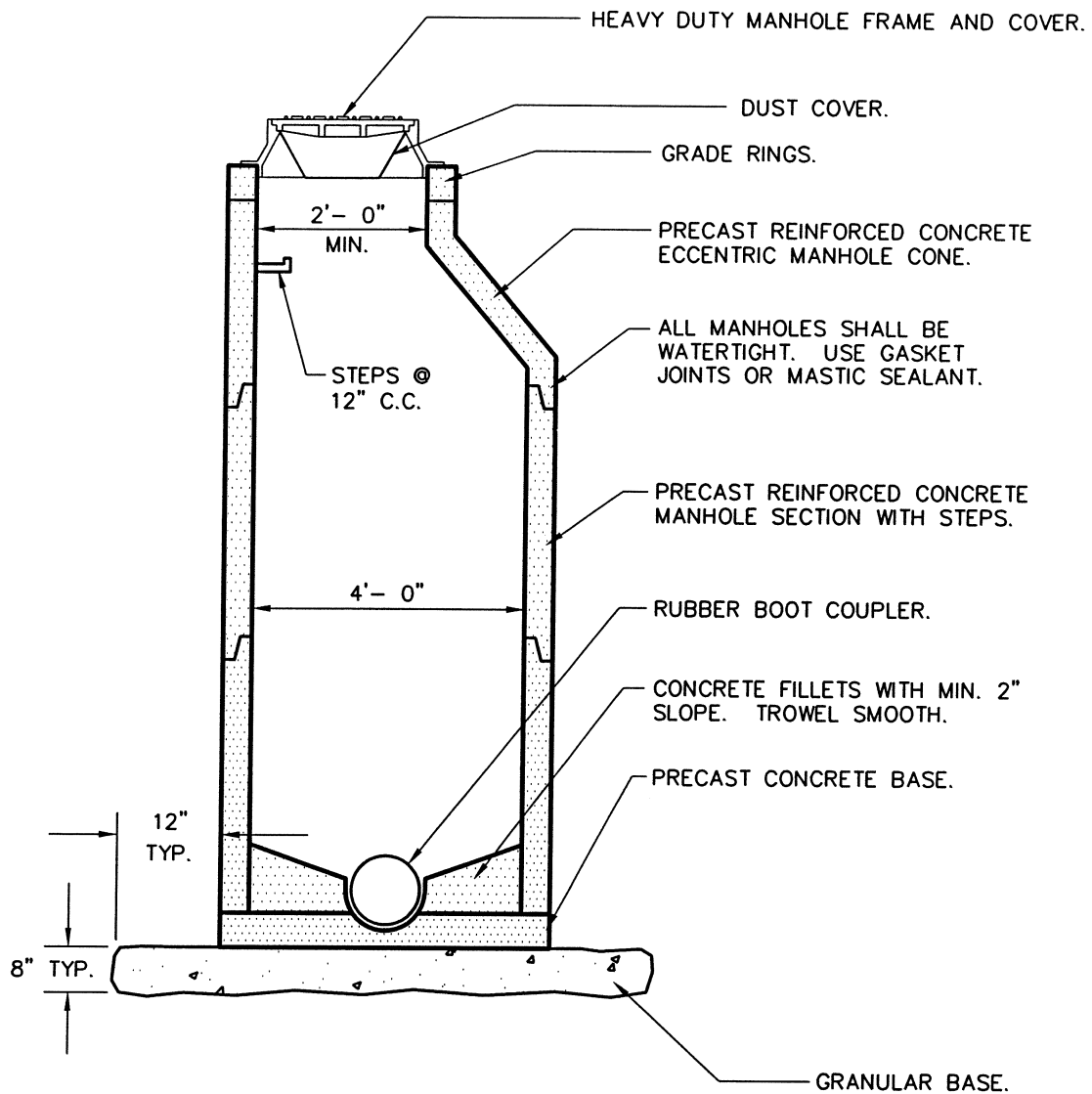
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SCALE: NONE

SS-03	KANE COUNTY	SS-03
STORM SEWER CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: SEWER	LAST UPDATE: 2/2/2009
		SHEET: 38



SEWER MANHOLE DETAIL

SEE SHEET SS-03 FOR MANHOLE COLLAR DETAIL.

REVISIONS

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SCALE: NONE

SW-01

KANE COUNTY

SW-01

SANITARY SEWER CONSTRUCTION

STANDARD DRAWING

DRAWN: LG

02-09

PEN

TBL:

_1stndrd-ir2800.cdb

PROJECT: 0901-014

SHEET:

CHECK: WM

02-09

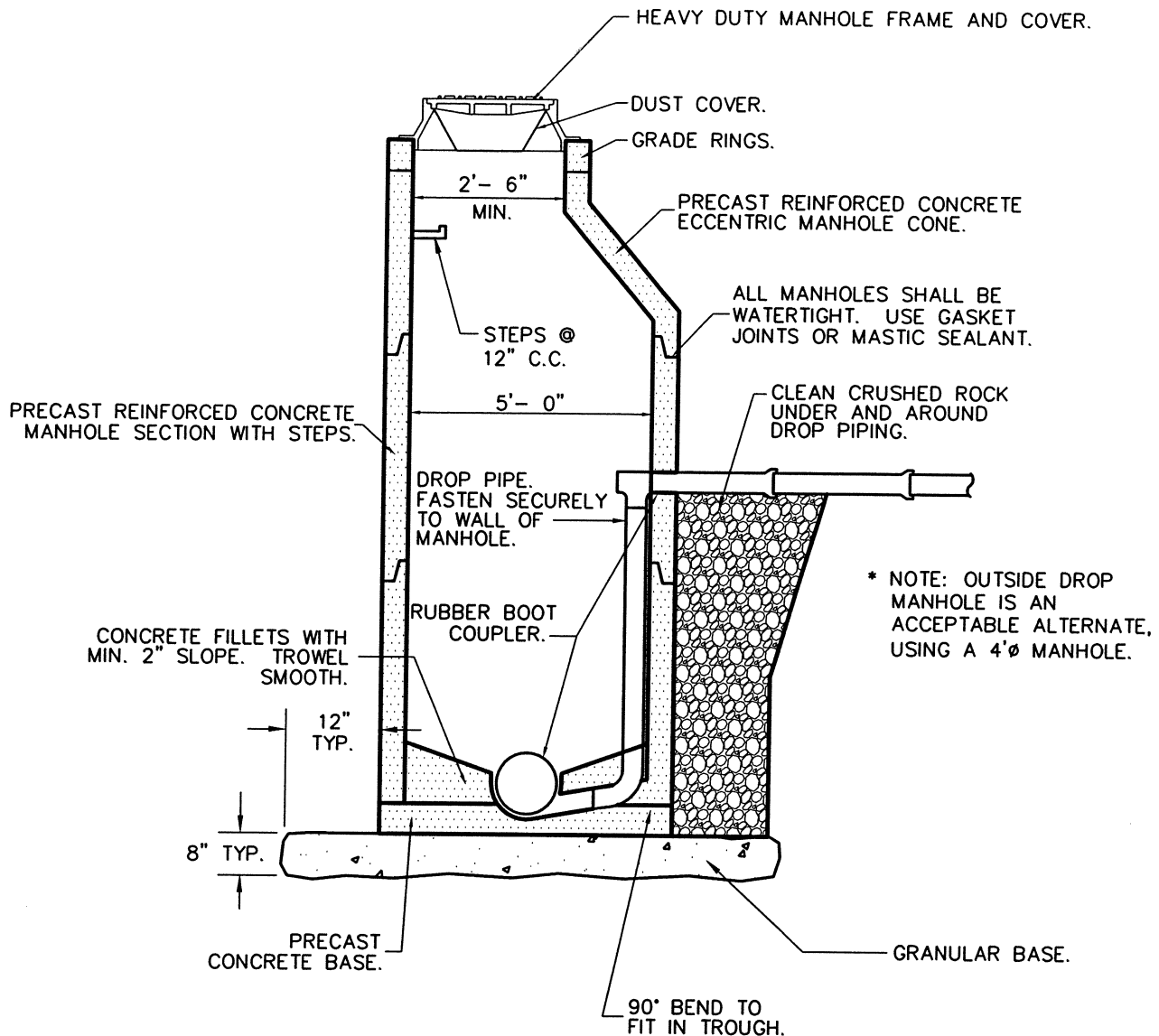
FILE:

SANSEW

LAST

UPDATE: 3/31/2009

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DROP SEWER MANHOLE DETAIL

NOTE: DROP PIPE AND FITTINGS SHALL BE SOLVENT WELD.

REVISIONS		
DATE	APP. BY	REMARKS



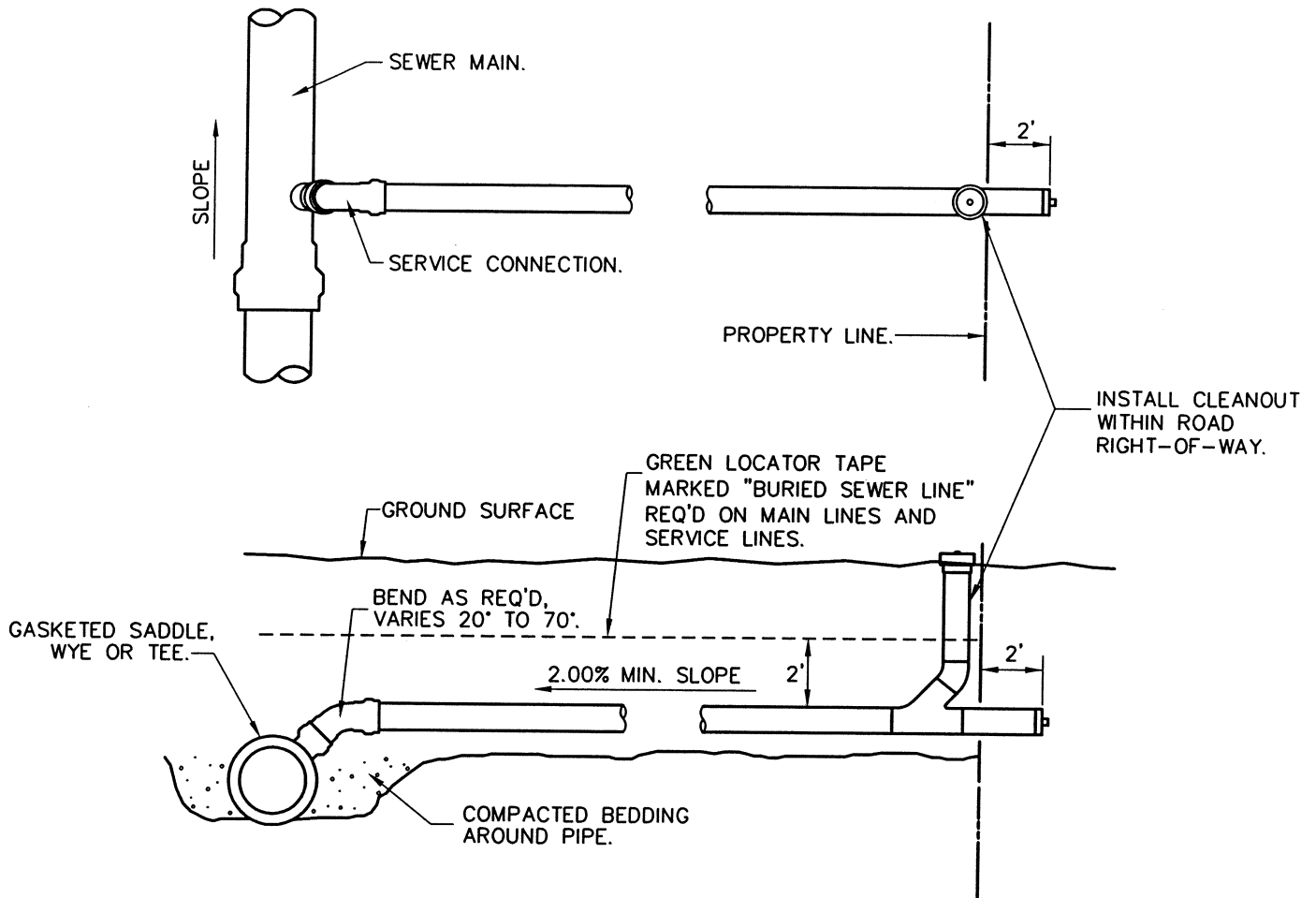
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SCALE: NONE

SW-02	KANE COUNTY	SW-02
SANITARY SEWER CONSTRUCTION		
STANDARD DRAWING		
DRAWN: LG 02-09	PEN TBL: _1stndrd-r2800.ctb	PROJECT: 0901-014
CHECK: WM 02-09	FILE: SANSEW	LAST UPDATE: 3/31/2009
		SHEET: 40



SEWER SERVICE CONNECTION DETAIL

REVISIONS		
DATE	APP. BY	REMARKS



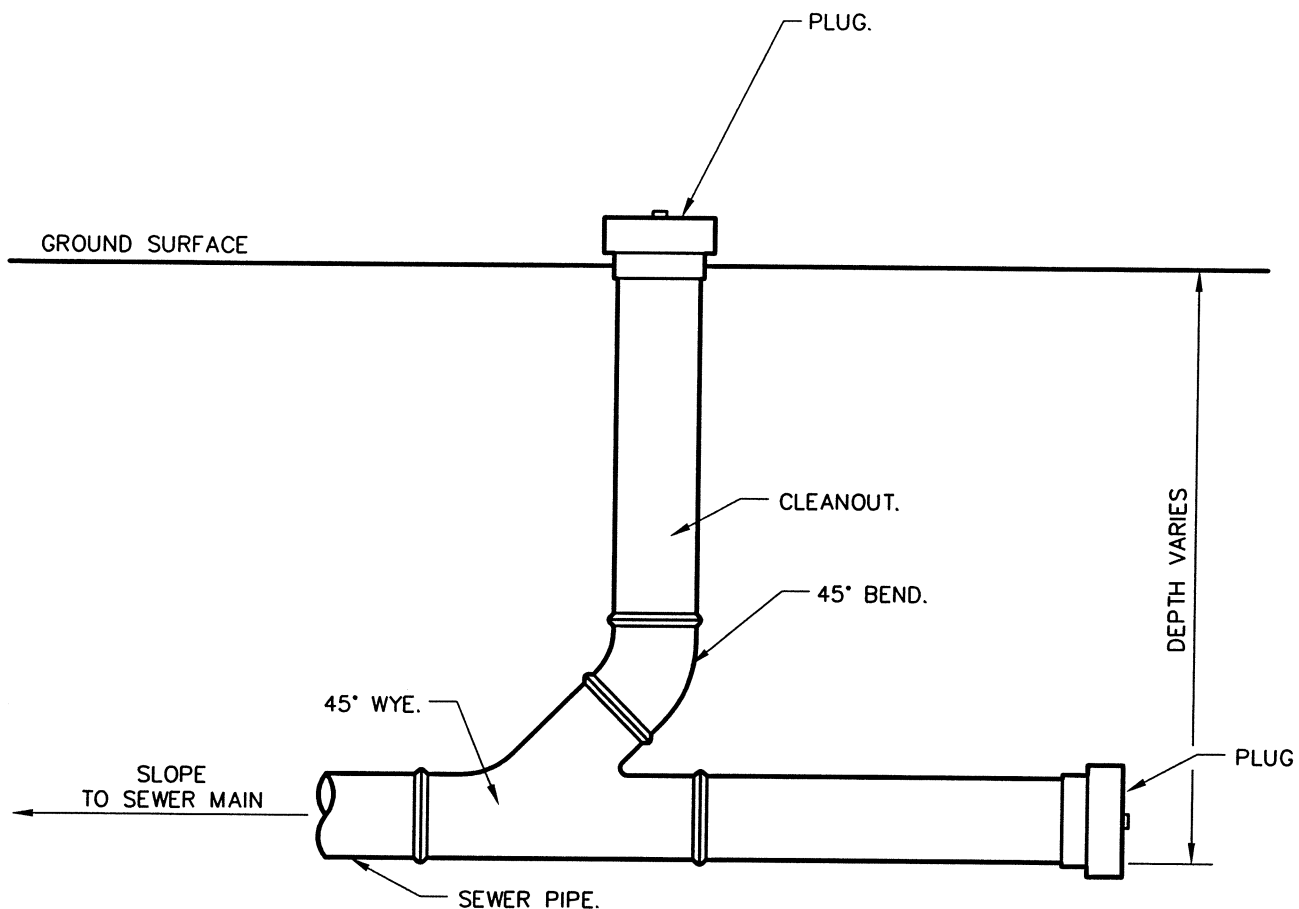
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SCALE: NONE

SW-03	KANE COUNTY	SW-03
SANITARY SEWER CONSTRUCTION		
STANDARD DRAWING		
DRAWN: LG 02-09	PEN TBL: 1stndrd-ir2800.cdb	PROJECT: 0901-014
CHECK: WM 02-09	FILE: SANSEW	LAST UPDATE: 3/31/2009
		SHEET: 41



SEWER CLEANOUT DETAIL

REVISIONS		
DATE	APP. BY	REMARKS

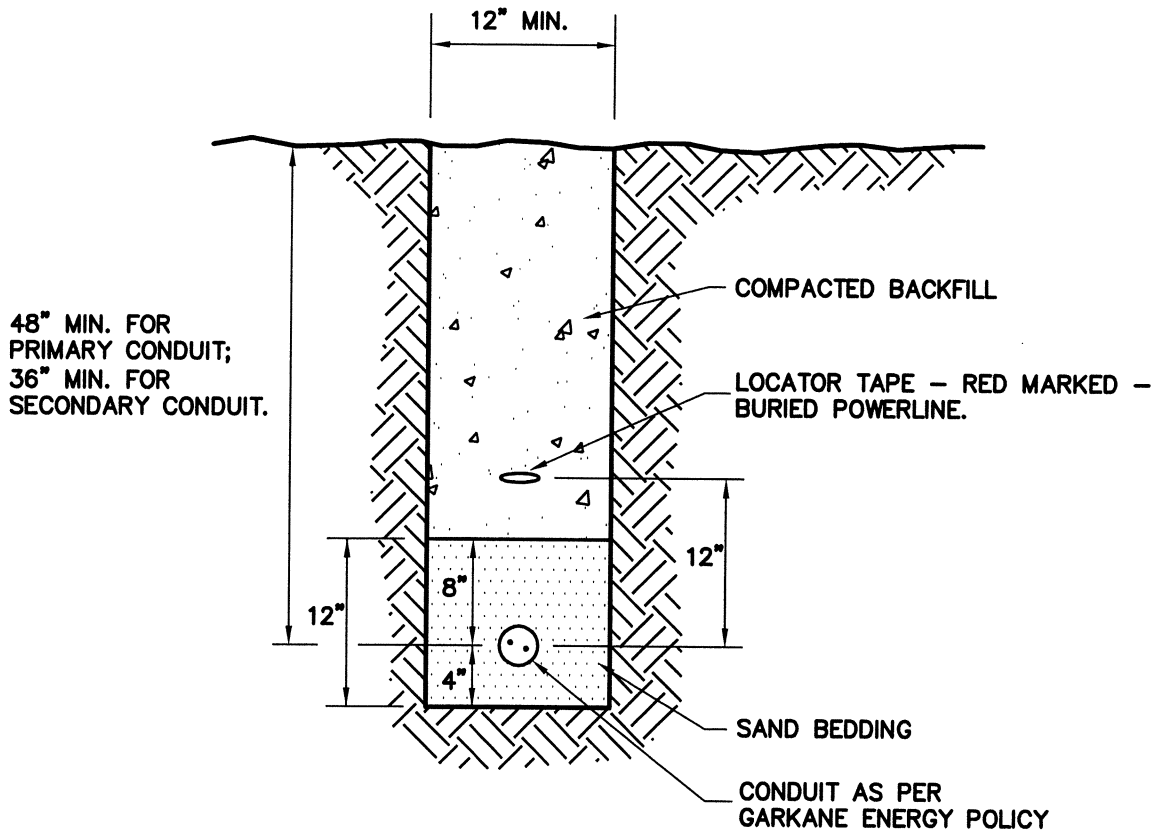


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SCALE: NONE

SW-04	KANE COUNTY	SW-04
SANITARY SEWER CONSTRUCTION		
STANDARD DRAWING		
DRAWN: LG 02-09	PEN TBL: _1stndrd-lr2800.cdb	PROJECT: 0901-014
CHECK: WM 02-09	FILE: SANSEW	LAST UPDATE: 2/17/2009
		SHEET: 42



ELECTRICAL CABLE/ CONDUIT TRENCH DETAIL

NOTES:

1. CABLES RUNNING ALONG UNPAVED ROADS SHALL NOT BE PLACED WITHIN THE ROADWAY.
2. TRENCHES SHALL BE STRAIGHT FROM POINT TO POINT AS SHOWN ON STAKING SHEETS.
3. ALL BACKFILL SHALL BE CAREFULLY PLACED SO AS TO PREVENT UNDUE STRESS ON CABLE.
4. ALL BACKFILL SHALL BE COMPACTED SO AS TO PREVENT SETTLING. CARE MUST BE TAKEN TO PREVENT DAMAGE TO CABLE OR CONDUIT.
5. NO CABLE WILL BE PLACED IN TRENCHES UNTIL TRENCH IS COMPLETELY PREPARED TO PROPER DEPTH, ALIGNMENT, BEDDING, ETC. METER BASE MUST BE INSTALLED AND INSPECTED BEFORE SECONDARY OR SERVICE CABLES CAN BE INSTALLED.
6. MINIMUM BENDING RADIUS IS 12 TIMES CABLE/CONDUIT DIAMETER. A MAXIMUM OF THREE 90s (OR THE EQUIVALENT) IS PERMITTED IN A CONDUIT RUN.
7. IF DEPTH OF POWER LINE AND OTHER UTILITIES CONFLICT, POWERLINE SHALL BE DEEPER THAN CONFLICTING UTILITY.

REVISIONS

DATE	APP. BY	REMARKS



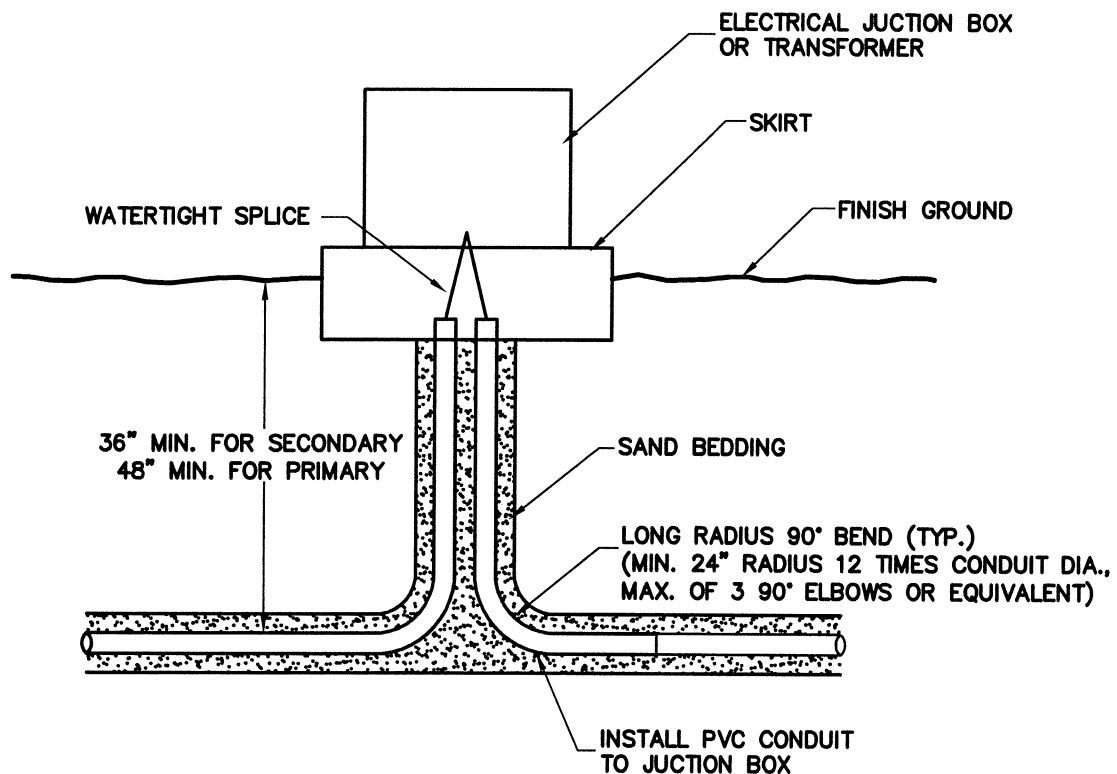
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SCALE: NONE

EL-01	KANE COUNTY	EL-01
ELECTRICAL CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-jr2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ELECTRICAL	LAST UPDATE: 2/13/2009
		SHEET: 43



ELECTRICAL JUNCTION BOX DETAIL

REVISIONS		
DATE	APP. BY	REMARKS



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SCALE: NONE

EL-02	KANE COUNTY	EL-02
ELECTRICAL CONSTRUCTION		
STANDARD DRAWING		
DRAWN: KJ 02/09	PEN TBL: _1stndrd-ir2800.ctb	PROJECT: 0901-014
CHECK: WM 02/09	FILE: ELECTRICAL	LAST UPDATE: 2/13/2009
		SHEET: 44